fds - look up for CDC 1988 study.

I. Introduction

- This chapter contains a discussion of the objectives of the study performed for Control Data Corporation (CDC). In addition, this chapter describes the methodology that was used in this custom work to obtain the conclusions and subject matter reported herein.

A. OBJECTIVES

- The primary focus of this custom work was to identify "the best industry market segments and applications in the systems integration market that meet the .... objectives of CDC." The original primary focus was to look at possible acquisition objectives. This was modified to be an evaluation of systems integration (commercial) at a meeting held at CDC World Headquarters on May 5, 1988 with no pre-conceived notion of acquisition.

- For each industry segment the custom work/study ~~was to~~ provides several applications that are, or could be, applicable to a commercial systems integration-type activity by Control Data.

- In addition Input ~~is~~ selected four market segments that seem particularly attractive to CDC

based on a series developed of COC's shall set for commercial systems integration.

- The applications are presented for all the major industry segments monitored by INPUT as shown in Exhibit I-1 below.

Exhibit I-1

MAJOR INDUSTRY SEGMENTS

MANUFACTURING (PROCESS and DISCRETE)	TELECOMMUNICATIONS
BANKING and FINANCE	INSURANCE
DISTRIBUTION (RETAIL and WHOLESALE)	MEDICAL
STATE and LOCAL GOVERNMENT	EDUCATION
TRANSPORTATION	SERVICES
~~UTILITIES~~	UTILITIES
	FEDERAL *

NOTE: FEDERAL NOT INCLUDED IN COMMERCIAL SYSTEMS INTEGRATION

B. Scope

The Scope of the report has been defined as described below:

1) The identification of four key industry or cross-industry market segments in commercial systems integration that have the best "fit" for COC

2) The identification of significant applications in each of the industry segments. This report does not purport to contain an exhaustive list of CSI applications

3) The inclusion of an industry market forecast for each of the segments for the years 1987 through 1992 including growth rates

4) The project focus is primarily on the U.S. market

C. Methodology

- The study is based on the use of secondary source material (e.g. INPUT files, trade publications, etc.) to develop a list of the key CSI applications.

- The dialogue with other INPUT individuals involved in performing primary research was also used.

- Based on the above each application system was categorized by the industry specific market segment that is most appropriate for that application.

- A screen or template of Control DATA's shell set to perform as a commercial systems integrator was

developed by scrutiny of the most recent annual reports and through an on-site meeting to discuss CDC's professional service capabilities.

- Using the ~~critical~~ CDC template and subset and comparing it with applications in each segment yielded a best "fit" scenario. Included in this scenario was a sense of the "emerging" CSI application systems. Emerging systems are those that will have a major market impact within the next five years. This emerging systems list was developed by ~~a~~ using existing DMUT data.

- The application "examples" provided for each industry segment have been selected from previous research projects performed by DMUT. In each case only the identification of the appropriate project is listed

- It is noted that there was no primary research performed as part of this project. In other words there ~~was no~~ was no questionnaire developed and used to call other vendors or users to determine their view of the CDC capabilities in CSI.

II Executive Summary

The purpose of this chapter is to provide a brief overview of the Computer Services industry, with specific focus on the Commercial Systems Integration market. In each of the subsequent industry application descriptions there are comments describing the "driving forces" for information systems and services in that particular industry segment. This chapter contains a summary of the driving forces for each of the key industry segments together with an outline of the key future applications by segment

Furthermore this chapter contains an outline of IMPACT's Conclusions and Recommendations, relative to Control Data and the commercial systems integration market

A. OVERVIEW

- There are a number of factors of main concern in management's view and thinking regarding Corporate information systems. They are:
  - an understanding of the importance of a corporation's information system has in providing critical mission applications and competitive advantage
  - an awareness the existing corporate investment in computer and information systems and software

needs to be leveraged to the maximum extent to derive maximum return of resources expended — an immense pressure on IS management to control or reduce expenses associated with current and future information systems expenditures

- Network integration has become an important systems concern among large corporations. This is precipitated by the distribution of computing resources throughout the organization which INPUT believes will continue on an increasing rate.
- The previous growth rate of information system budgets has declined. The double digit information systems budget increases have given way to increases of 7-8% per year.
- Personnel costs continue to represent the largest single item in the IS budget. INPUT estimates this item to be approximately 37-39% of the IS budget
- Systems integration projects are now more and more acceptable in the commercial sector based on the perceived successes in the Federal sector
- As commercial systems integration successes are realized and communicated a major impact is likely to occur on the commercial information industry

- The growing impact of commercial system integration will require the development of new skills and expertise. The importance and availability of these skills in sufficient quantity must not be underestimated by the commercial system integration vendor.

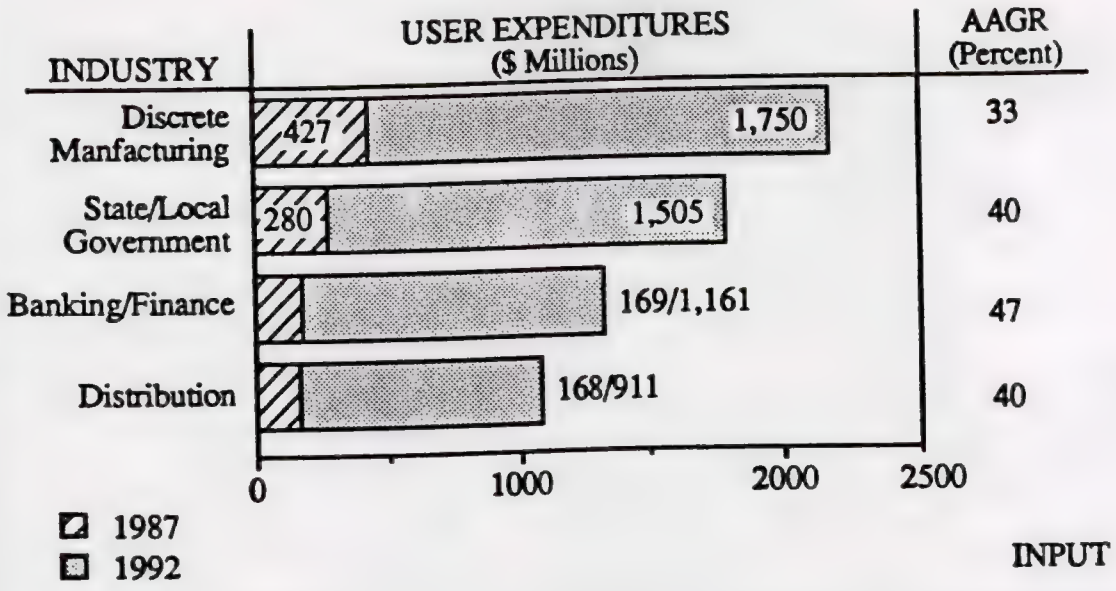
B. Market Forecast

As part of monitoring the opportunities in ~~DoT~~ commercial system integration DIPOT has developed a five year market forecast. Exhibit II-1 shows the major industry segments with their revenues in 1987 and 1992 and the average annual growth rate. The four largest industry segments are Discrete Manufacturing, State + Local Government, Banking + Finance, Distribution (Wholesale + Retail) which are not the four DIPOT believes are the best fit for Control Data. The four industry segments that DIPOT believes are the best fit for Control Data are Banking and Finance, Manufacturing, Utilities, and Education.

The basis for these industry selections, wherein Control Data has the best fit is due to an assessment of the current skills and tools currently available within CDC and/or the ability to easily acquire the requisite skills. Acquisition of these skills in this context speaks to doing it in house ~~their~~ through conscious focus on the

Exhibit II-1

CSI EXPENDITURES BY INDUSTRY SECTOR
1987 - 1992



NOTES:

MPRE-270a

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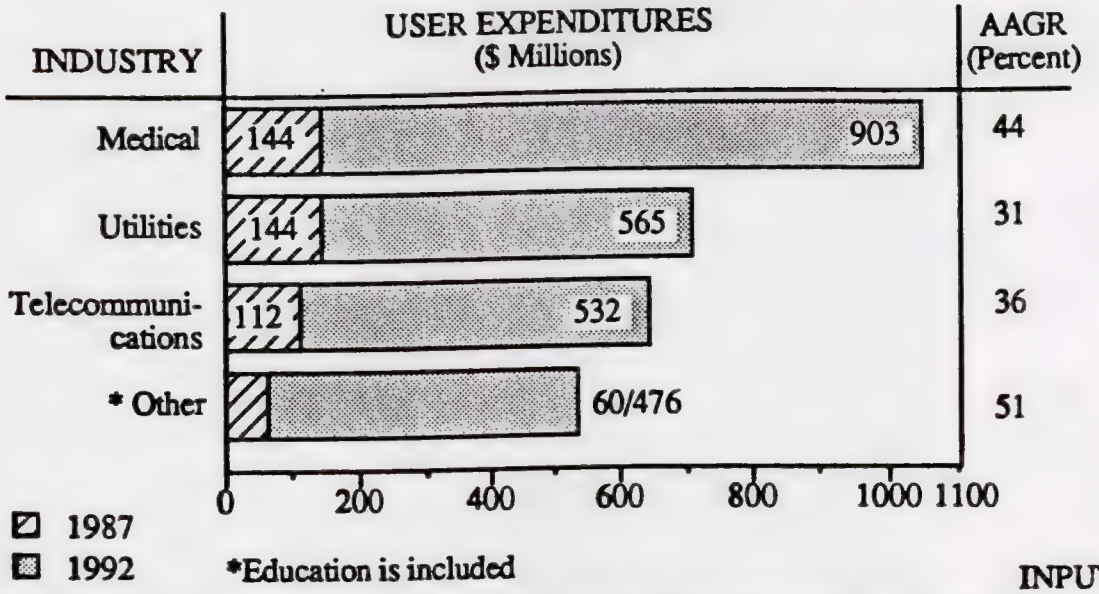
Exhibit II-1

CSI EXPENDITURES BY INDUSTRY SECTOR
1987 - 1992 (Cont.)



NOTES:

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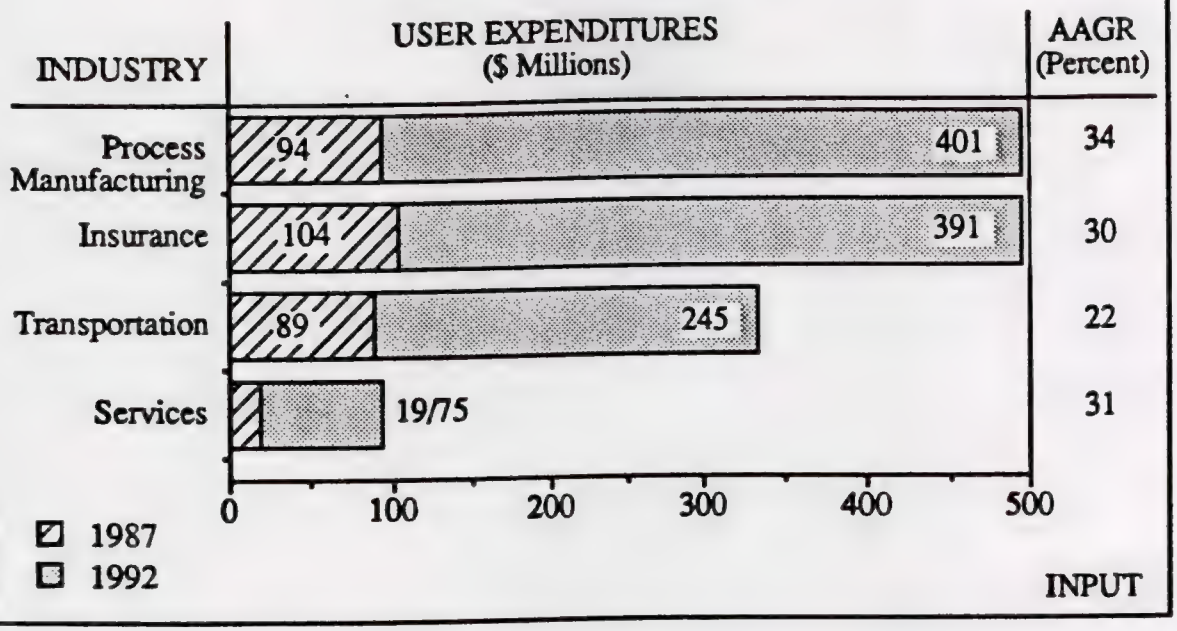
Exhibit II-1

CSI EXPENDITURES BY INDUSTRY SECTOR
1987 - 1992 (Cont.)



NOTES:

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industry or through the hiring of additional individuals with the requisite skills. Acquisition in this context does not mean by buying another company.

c. Conclusions and Recommendations

- In the following chapters of this report, DIPUT has identified a variety of specific commercial systems applications. The applications identified are prevalent in the various industry sectors, as reported, at the current time. Some applications that are identified are currently under development and appear to be applications that will become common in their respective industry segments at some time in the future. The report also contains a series of examples, by industry segments of large commercial systems integration projects that are known to DIPUT.

- DIPUT understands that CDC is using the information in this report to investigate the feasibility of enhancing its current commercial systems integration activities. Therefore DIPUT would like to offer ~~our~~ several thoughts and recommendations as to how this report information could be used in that fashion.

- It should be noted that the vast majority of the commercial systems integration applications described in this report are highly customized. That is, there is very little in the way of off-the-shelf components used to provide the application capability. In fact, the very reason for system integration suggest customized specific application-type, generally requiring high labor content and significant expertise.

- A close scrutiny of the descriptions of the various applications described in this report reveals that the applications are primarily applicable to the specific industry segment for which they are developed. Thus there is little sense of application portability from one industry segment to another. Further, within an industry segment, the buyers (users) of custom commercial systems integration applications have a keen interest in ensuring that the applications are not off-the-shelf. This is due to the fact these applications are viewed as mission critical and the very nature of the application is at the core of the competitive advantage of the client's company in its market.

Therefore if the client believes its system can be replicated by its competitor contracting with the same vendor the client would not be inclined to contract with that particular commercial systems integration vendor; certainly not for a packaged solution. In the very least the client wants a unique system (or application) to perform a unique function (or at least a common function in a unique fashion), so that the client receives perceived competitive advantage. [Note: the above statements express the user's perception. The vendor can have acquired insight and knowledge that can be applied to the next application system.]

- The above statements are not applicable when considering generic applications such as payroll, account receivable, etc. These are considered to be cross industry applications or utility functions and are not normally of primary application requirements for commercial systems integration vendors. Thus, while CDC has extraordinary expertise and applications knowledge and capability in a fair number of cross-industry applications it is true that these skills will not be very helpful in CSI.

- An additional consideration is the current requirement of many of the CSI applications i.e. embedded is that of a strong network requirement. Very few of the CSI applications are stand-alone systems. Instead they are normally integrated into a complex system environment generally requiring a networking function. This, in itself, drives the requirement for ~~an~~ application customization.

- CDC needs to consider that frequently, the prospective client does not believe a single organization can adequately perform in all the functional areas required to develop, implement and install a complex, customized system. It is true that most successful systems integrators (especially in large, complex projects) will subcontract portions of the application to other vendors. Client recognize this as the norm and may be concerned when a vendor represents itself as being able to perform all tasks in an exemplary fashion. In fact, recently there has been a tendency for the client to insist that it be included in the CSI project being viewed as a sub-contractor.

- Therefore, when considering the above, Input strongly recommends that CDC consider the following approach as it views its enhancing of current activities in the commercial systems integration market:

1) View the commercial systems integration market as one in which CDC can capitalize on its existing system development capabilities. That is, Input believes CDC can represent its systems integration strength as being the depth and breadth of its technical system development skills, expertise and experience.

2) CDC should augment its personnel skills capability by adding selectively to add expertise in the four industry segments Input believes are the best "fit" and make the most sense at the time, namely: Banking and Finance, Manufacturing (Discrete and Process), Educations and UTILITIES. [Note: an acquisition of a significant professional services firm would cause a re-assessment of the above four based on the applications expertise and industry focus of the acquired company. However, DIRECT believes the four chosen would be likely be important almost irrespective of any acquired company.]

3) At this time, while CDC is recognized as an important information systems vendor in many respects, it is not commonly viewed as a commercial systems integrator (except in the industry sector). With this in mind, Input recommends that CDC cautiously consider entry into the commercial systems integration as a co-contractor or as a sub-contractor. If this were done in partnership with a vendor that has an existing significant presence in the systems integration area, CDC could facilitate its ~~or~~ market entry into these three other ~~[illegible]~~ industry segments (not a valid comment for UTILITIES). The most likely organizations are the Big Eight accounting/ a major professional services firm or possibly hardware manufacturer. ~~[illegible]~~

4) In summary, Input is recommending that CDC's entrance into the commercial systems integration market by successfully developing products that are unique and that will, when introduced, result in a significant advantage to the organization. This is Input's view of CDC's

with the energy management systems application.

Input also suggests that as part of the process of augmenting the [commercial] systems integration thrust that CDC look at its inventory of those system components capabilities which could logically become part of future commercial systems integration projects. For example there must be some skill sets in the federal government operations that could be transfered, duplicated or leveraged in the commercial sector. This is a part of the thinking of CSC and [INPUT believes it] seems logical and straightforward for CDC as well.

Finally, Input does recommend that CDC persue an acquisition to accelerate the penetration into the commercial systems integration as well as continue to organically grow the existing thrust in the four industry segments INPUT recommends continued pursuit in.

III CDC TEMPLATE

In the course of performing the custom research assignment it became necessary to develop a "template" or "screen" with which an assessment could be made of those commercial systems integration industry segments that represented a best "fit" for CDC.

This template was developed based on an insightful meeting with CDC early in May and information contained in DATAPRO's files. This information is collected through the monitoring process DATAPRO uses to track major or contributing companies in the Information Services industry. From this data and internal discussion a template was developed to use in the industry segment selection process.

Exhibit III-1 shows Input's observation and judgement on the CDC strengths and weaknesses relative to its being viewed as a commercial systems integration vendor. These are general parameters evaluating the corporation in general. Exhibit III-2 is a commercial systems integration internal capability or skill set evaluation of CDC based on the information sources available to DATAPRO. Input, by the way, has performed similar analyses on existing and prospective CSI vendors so there is consistency in the approach.

Exhibit III-1

CDC Strengths/Weaknesses: ~~AS~~ Commercial Systems Integration

Strengths

Engineering/Scientific process knowledge
Project Breadth
Communications/networks
Project Management
Education + Training
Maintenance
Significant Financial Resources
Technology

Weaknesses

Industry segment marketing
Standard Applications Software
Commercial skills
Magnitude of professional service
Strategic Alliances
Commercial credibility
Financial stability
Marketing

Exhibit III-2

CDC

Internal/CSI Capability Evaluation

CSI capability	CDC Evaluation
Consulting	3
Design/Integration	3
Project Management	4
IS Hardware	4
Communication Hardware	3
Software Development	4
Packaged Application Software	2
Packaged Systems Software	2
Education + Training + Documentation	5
Network Management	4
Service + Repair	5

1 = Weak, 2 = Fair, 3 = Average, 4 = Good 5 = Strong

This evaluation is reasonable and comparative to IBM, DEC and UNISYS. Furthermore it suggests that CDC has the raw internal skills to compete in the CSI market. The obvious weakness is specific industry expertise and experience.

In selecting the four industry segments to have CDC focus on Input used the five areas in the internal skills coupled with some of the limited industry expertise already available at CDC. The Exhibits III-3 through III-6 describe the industry expertise that CDC can build upon.

Input generally evaluates for each of eleven the components and elements of CSI the strategic relationships that the CSI vendor has in place to augment their internal ~~skills~~ skills. Input is not aware of any such strategic alliances that CDC has that would materially effect its ratings at this time.

two points:
Input has developed two additional observations to assist CDC in its efforts to enhance its commercial systems integration performance

First, CDC will need to cultivate some strategic alliances to be taken seriously in the CSI market. Users are aware that no one company, not even IBM can go it alone. Alliances show existing customers and prospects the ability to shoulder the responsibility. Examples of

Exhibit III-3

CDC Banking + Financial Industry Expertise

- Micrognosis
- Credit Union Systems
- Loan + Deposit Accounting Systems

Exhibit III-4

CDC Manufacturing Expertise

- Computer Integrated Manufacturing
- Chemical / Pharmaceuticals
- Seismology / Oil Exploration

Exhibit III-5

CK Education Industry Expertise

- Super Computer Hardware
- Administration applications
- Convex alliance
- Participation in educational environments

Exhibit III-6

CK UTILITIES Industry Expertise

- Energy Management Systems
- Energy Management Systems
- Energy Management Systems.
- MAPPING

alliances would be in packaged application software such as MSA or McCormack and Dodge ~~for~~ communications hardware such as T1 boxes from Network Equipment Technologies or any of its competitors.

Second, I ~~don't~~ suggest that COC leverage its existing skills and services to become more effective in the commercial systems integration market. As part of this leverage COC can use ~~of~~ internally developed "off the shelf" solutions that may be considered internal to COC as turnkey but viewed by the prospect as custom. An example would be in the Utilities industry where COC has had considerable success with energy management systems applications. While this may be viewed as "turnkey" internal to COC it should always be expressed as custom to the user a prospect. After all users are in a better frame of mind to pay for custom versus turnkey application systems.

IV Application Systems – Four Target Industry Segments for CDC

This chapter contains the four target industry segments that DPOT recommends CDC embrace its capabilities and pursue in a proactive manner. Each of the four segments is presented with a list of driving forces, current application examples and future application examples.

In general each of these industry segments were chosen due to some or all of the following:

- CDC has exhibited some industry knowledge and personnel expertise in the chosen industry segment
- CDC can tackle the majority of the interesting and viable applications leveraging its core skills of project management, major engineering/scientific background awareness and its ability to solve technical problems
- CDC's communications and networking experience can be effectively leveraged or modelled in many of the applications in the industry sector.
- CDC's expansion product and software development capabilities match the needs and requirements of the industry segment
- CDC's ~~no~~ third party maintenance organization can be effectively utilized to meet serviceability repair and response time needs.

A. Manufacturing Industry Segment

1. Driving Forces

- The discrete manufacturing industry is the largest single market for any type of information services vendor. In addition to being the largest segment, the discrete manufacturing industry is also one of the fast growing segments. The manufacturing industry segment can not be looked upon as a monolithic industry segment. There are a great variety of types of manufacturing organizations each with their own information systems requirements.

- The sheer size of the manufacturing segment has attracted a large number of commercial system integration vendors each attempting to differentiate itself and find a market niche. For example, the process control portion of the manufacturing segment represents a sector whose various member firms have similar characteristics. These characteristics are
  - manufacture of a product in a bulk process
  - Continuous flow of the process
  - high volume and highly automated
- Equipment used in the process control sector tends to be extremely specialized and specific to the particular product being manufactured.

- Companies in the process control sector are highly capital intensive with a high ratio of capital to labor.

2. Current Applications

- Bill of Materials ~~planning~~ planning — related to the assembly of components into subassemblies.
  - These applications typically allow the scheduling and control of multiple assemblies with a variety of levels of subassemblies

- Product configurators
  - These applications will configure and retrieve a bill of materials for assemblies with specific model options. The system stores and maintains both model information and option information. Such systems can retrieve engineering and manufacturing routing and product information from an overall manufacturing database.

- Engineering machine control processor -
  - This application controls the relationship between assembly functions and the specifics of the bills of materials for these functions. Such items as

Add to Manufacturing in Current Applications section:

- Computer-Aided Design / Computer-Aided Manufacturing / Computer Aided Engineering.

  - While there is undoubtedly room for additional CAD/CAM/CAE systems, I don't believe the real opportunity in this area is with a systems integrator being able to integrate, wherever possible, these various systems into an overall manufacturing system

- Computer Integrated Manufacturing

  The opportunity of a systems integrator is to take the manufacturing floor and on a cell by cell basis provide the integration of the manufacturing process. This has been initiated rather successfully by Arthur Andersen and UNISYS both of which have extensive manufacturing level models to show their respective prospects. This is, perhaps, the single greatest opportunity in the discrete ~~manuf~~ manufacturing industry

starting and ending dates, engineering changes and pending engineering changes are maintained and reported to the user. Typically this application is integrated with an overall bill of materials/ production control application

- Schematic design application
  - This application creates patterns and symbols from lines, arcs and text. For example, in electrical design, it assigns "electrical" parameters for interfacing to a routing system and to a simulation system. It also provides a network list and develops a schematic for a printed card circuit board and routes the production of the ~~card~~ circuit board within the overall production operation.

- Machinery monitoring system
  - These applications are designed to detect machine malfunctions in the product or process, before the malfunction can affect the product being produced. Typically, they detect defects on machinery that are characterized and identified by changes in the acoustic signature of the machine. The software can be ~~performed~~

pre-programmed to establish ~~data~~ alarm points on the data being managed, when an alarm point is reached, the system can alert a human operator or take the malfunctioning machine out of the production flow and reschedule the production around the ~~data~~ ~~machine~~ equipment.

- Quality Control Plotting
  - These applications typically produce quality control statistics and analyses of the statistics for production cycles on the manufacturing floor. They will plot the frequency and the distribution of these statistics and produce a variety of statistically derived data such as Poisson curves, normal and exponential probability curve overlays. These applications also generate mean, range, standard deviations and individual variants. The output consists typically of parameter tables and percentile charts.
    percentile

3. Examples
   - A material management system has been developed for Detroit Edison by Electronic Data Systems (EDS). This project was completed two years ago and EDS still receives modification

and enhancements to the system.

- A just-in-time inventory control system was developed for General Signal (vendor anonymous). Information obtained by Input indicates that this was a project that involved development fees in the upper seven figures.

---

4. Future Application Projects
   - Quality Control Decision Management Systems
     - This application will collect, analyze and display variable data from the manufacturing process and from product test workstations. It will provide control charts, histograms and scatter diagrams to identify product control problems. The software will have the ability to identify the cause of these problems and identify the relationship between the process, the materials, the workmanship and the product defect itself.

   - Production and Inventory Optimization Scheduling.
     - Integrated information systems are being developed to integrate bill of materials planning, materials resource planning, shop floor control, master production scheduling, purchasing and cost

management. These applications can support a single plan, or multiple plans, using the explosion of the bill of materials. The system encompasses both production scheduling and production planning.

B. Banking and Finance

1) Driving Forces

- The financial industry segment is the most regulated segment in the U.S. Regulation normally suggests a high degree of standardization and to some extent this is true. However because of competitive pressure financial institutions are beginning to show great diversity in their marketing and operations and thus in their information system requirements.

- These same competitive pressures are creating the need for product diversification based on innovative information systems. These new products and systems, in turn, generate the need for a variety of new systems.

- In addition, these competitive pressures are creating a note of instability in the financial sector: a level of instability that was nearly absent in the

past. For example, major banks such as Continental Illinois and the Bank of America have been on the verge of bankruptcy. More recently there have been a rash of major failures of savings and loans throughout the U.S. putting a strain on the FSLIC.

There is a marked industry trend at this time, which reflects a consolidation of financial institutions throughout the U.S. This consolidation is characterized by the following types of events:

- Commercial banks acquiring Savings and Loans
- Interstate banking
- Major banks acquiring smaller banks and bank holding companies, on both intrastate and interstate basis

- There has been considerable pressure on Congress to loosen or repeal the Glass-Steagall Act. The recent market crash (Oct 1987) has reduced these pressures and it seem that, at least for the time being, the Glass-Steagall Act will remain in place, ensuring the separation of banking and ~~trading~~ brokerage organizations and activities

2. Current Application

- Trust Accounting

- Integrated system applications for trust accounting are available to small, medium and large

- Add to ¢ banking + finance as first in section 3.

- Central Information File

The centralized information file, in the context of financial services, has been under development, in various ways, for many years. However, relatively few multi-product financial service organizations have a complete centralized customer information file.

Such a file is vital to support a highly integrated, full scale financial service organization. The development effort to create such a system is immense; yet a vast market awaits the systems integrator who is able to develop and install such a system.

- Third Party ATM/POS Services

The demand for increased quantity and quality in electronic banking services is immense. At this time, electronic banking has basically involved stand-alone ATM or POS systems. The ability to effectively and economically link a variety of these systems together, to facilitate more convenient financial transactions at the retail level, represents a prime opportunity for any systems integrator.

banks. Trust, IRA and farm accounting systems are frequently included within a trust accounting system. Also frequently included are stock investment reviews, asset maturity maps, market value updates and stock and bond portfolio reporting. Depending on the particular requirements, a trust accounting system can also handle client and indirect lease accounting.

- Fixed assets accounting
  - These applications can be used within the financial institution itself, or in relation to major client accounts. They allow for a variety of depreciation methods and generate monthly depreciation accruals and schedules. A key element of these systems is their ability to provide advance warnings related to those assets which are approaching salvage value. These applications typically offer a multi-year projection of depreciation expenses.

- Forced Closed Accounts Systems
  - This type of system allows a bank to take a closed account, within which there are losses, and distribute the losses throughout multiple general ledger accounts within the bank. The system allows inquiry and changes to the system's database, and handles

the creation and resequencing of bad loan data. The system reports and lists the forced, closed accounts and sorts them by a variety of methods for general reporting purposes.

- Branch Customer Information System

These systems are typically integrated systems and designed for use at the branch level. They support demand deposit accounts, savings accounts, CDs, installment loans, credit cards and ATM usage statistics. Data is combined into a centralized report of customer/account information. These reports summarize various transactions and normally include a daily audit journal. These systems typically have multiple access security levels.

3. Other Examples
   - Central Information File (CIF)
   - Claims Processing
   - Loan Processing
   - Electronics Funds Transfer

4. Future Applications Projects
   - International/Domestic Function Integration
     - These applications are designed to integrate international banking functions into a commercial

bank's operations. The Subsystems include such functions as foreign exchange, foreign exchange exposures, balances and positions, placement and loan transactions, money transfers, wire transfers, letters of credit and bankers acceptance and multi-currency accounting.

- On-Line Banking System Reconcilement

These systems are designed to eliminate the lengthy and labor-intensive batch proofing operations at the end of the banking day. The reconcilement is done on-line during the check processing application. The key goal of the application is to detect single free items and out-of-balance deposits. The application automates the manual aspects of check reconcilement and eliminates the need for manual searches for the specific data required in the reconcilement process.

- Bank Calling Officer's Workstation

- These integrated systems store data describing sales people, bank branches, regions, customers and prospects. Data can be organized by both SIC codes and bank products. The system tracks sales call activities by prospect, customer, calling officer, brand, product and industry.

- Wirenet Funds Transfer and Management Systems
  - These systems integrate and interface Fedwire, Bankwire, SWIFT, Telex and TWX. They contain pre-formatted message templates and the automated data mapping related to wire service formats, security, advice generation and record storage. The system tracks the bank's position at the Federal Reserve Bank and allows for demand deposit accounting and general ledger posting.

C. UTILITIES

1. Driving Forces

- The utilities industry is divided into three major categories or ~~segments~~ sectors:
  - ELECTRIC
  - GAS
  - WATER and Sewage/waste Disposal

- The utilities industry is highly regulated, setting it off in certain characteristics from other industry segments.
- The computer systems used in the operations side of utility applications combine real-time process control applications with engineering and technical simulation.
- Because of the highly regulated nature of the utilities industry, the financial and administrative

applications combine business-oriented information with state and federal regulatory compliance applications.

- The utilities industry is currently going through a period where there is significant hardware and software obsolescence occurring.

2. Current Applications

- Utility Billing

- There are a variety of billing applications in existence within the utilities industry. Typically these applications contain the following functional capabilities:
  - Variable period statements
  - Customer listing with aging
  - Delinquency and last payment information
  - Master list of service codes
  - Calculation of finance charges
  - Account aging
- Within the context of utility billing, there are a variety of interface capabilities; typically utility billing packages interface with the utility's general ledger package

- Outage Reporting Systems
  - These systems contain a database containing details of all distribution outages. The systems determine reliability levels and pinpoint ~~areas~~ areas with high outage rates. In certain cases, the

systems can determine emergency crew needs and assess the efficiency of emergency procedures and personnel.

- Revenue Generation Simulation
  - These systems are applicable to both electric and gas utilities. They simulate revenue generation based on various type of forecasts concerning weather, and other factors concerning demand.

- Utility Customer Service Systems
  - These systems maintain a complete customer profile within their database. They include applications such as budgeting, billing, service orders, cash management, deposits, credit and collection, usage estimates and deferred ~~payment~~ payment agreements.

3. Examples
   - Automated Meter Reading
   - Customer Billing Information Data Base Development
   - Job Order System
   - ~~Personnel~~ Personnel Accounting System
   - Energy Management System
4. Future Application Projects
   - Interactive Utility Systems
     - These tend to be multi-company, multi-cycl

systems. They can provide the user with current and historical account data for all utilities used by the customer. The systems provide actual current billing applications as well as generate historical data. For example, some can produce reports containing previous consumption history by periods, surcharge capabilities, and the financial history of each customer.

- Construction Management System
  - These systems are oriented toward both electric and gas utilities and involve construction planning, estimating and control systems for future construction projects.
- On-Line Customer Information Systems
  - These are interactive, on-line database oriented systems and include both billing from the data base, and on-line information systems for customer service purposes. They allow all information, including cash and meter readings, to be updated in real-time.
- On-Line Transmission System Planning
  - These systems are oriented toward electric utilities and are designed to evaluate the alternative transmission expansion plan for the utility. The system can measure the effects of expansion plans on the utility system and can calculate a performance

index for each planned system, so that the various plans can be compared quantitatively. Problems caused by any plan can be isolated by the system and the system will allow the user to examine various aspects of the plan, in various levels of detail. These systems are also designed to generate information for submission to various regulatory agencies.

D. Education

1. Driving Forces

- Most post-secondary institutions are in a period of consolidation as a reaction to meeting significant budgetary and cost constraints
- Most four year colleges and universities now adopt aggressive marketing techniques in order to attract good students ~~etc~~ and faculty members.
- The administration of most post-secondary educational organizations are aware that computer literacy is an important part of student education. However, their approach to providing computer literacy is often fragmented and ~~uncoordinated~~ uncoordinated.
- Two year colleges and vocational schools are also increasing their attempts to provide their student bodies with various forms of computer literacy.

- There has been a dramatic increase in the use of computers in the academic area, in both primary and secondary schools throughout the U.S.
- A significant number of high schools, elementary ~~skills~~ schools and vocational schools are using computers for both academic and administrative functions.
- School systems at the elementary and secondary levels are prone to form cooperatives so they can take better advantage of computer systems for academic purposes.

2. Current Applications

- Fund Accounting

Fund accounting systems can either include, or interface, with ~~acc~~ accounts payable, account receivable, general ledger, payroll and other types of financial systems. Basically, these systems generate cash requirements, showing cash flow needs over various time frames and an audit trail for expenditures during the past several accounting periods. These systems also maintain up to 40 to 50 account funds, providing a variety of transactions for accounts per fiscal period. The systems ~~also~~ also prepare reports on individual funds and generate detailed transaction journals

- Transportation Analysis Systems
  - These systems are basically oriented toward school systems where pupil transportation is an important element of the overall administrative function. These systems pertain to all aspects of the school district transportation policy, including maximum and minimum loadings, early pick-up times, starting and dismissal times and, taking all of these factors into consideration, produce a unified routing system. They typically generate transportation summary reports concerning vehicle miles, reimbursable ~~pupil~~ pupil miles, etc....

- Student and Class Scheduling
  - These systems are in common use in most higher and secondary educational institutions and allow the scheduling of students and classes and the interaction between the two groups of variables. These systems are typically performed on a batch basis, but currently there are a large number of systems, especially in the higher education institutions, that perform these functions on an on-line basis.

3. Examples (OTHER)
   - Student aid System
   - Computer-aided Instruction
   - Office Automation

4. Future application projects

- Financial Aid and Management Control Systems

- These systems are beginning to emerge in post-secondary educational institutions. They support the US Office of Education and state financial aid requirements for student reimbursement purposes. They typically operate through an interface with the institution's data center and support the complete array of financial aid available to students

- Student Information Systems

These systems vary significantly in their scope and are basically installed at the college and university level. They are able to track a student from the time of initial application through his/her academic career, through graduation and, further, will provide alumni-related information.

- Student Loan Systems

These systems provide record keeping and loan information, from application through final loan payment. They tend to be developed to support federal, state and private loan reporting requirements. Systems under development enable an on-line inquiry capability and the automatic generation of vouchers, checks, promissory notes, repayment schedules, etc. The more sophisticated systems provide an audit trail, multi-school

capabilities and user defined processing rules and regulations for the system.

E. Summary

These four industry segments have a considerable amount of potential for COC and take advantage of areas of expertise and capability that COC possesses. Commercial Systems integration is an activity that requires intimate industry knowledge that can be used to creatively solve the needs. COC has that requisite industry knowledge or skills (based on the inventory of professional services staff) to make considerable penetration and compete in the aforementioned industry segments.

Of the industry-segments are of interest for factors beyond this study the Urgent recommends COC make a formal acquisition to bring some industry knowledge and expertise in house. This would be accomplished by an acquisition similar to that Computer Sciences made in 1976 when it acquired Computer Partners.

V Application Systems – Other Industry Segments

This chapter discusses the remaining industry groups and the applications that are occurring as part of the commercial system integration thrust Input is monitoring. These industry segments were not selected for some or all of the following reasons:

- It was INPUT's assessment that COC did not have the required skillset and industry experience to effectively compete in these industry segments.
- There was no overall fit with the nature of the applications ~~and the~~ required in these industry segments and the internal developmental skillset currently available at COC.
- The application tend to be more "administrative" versus "operations" to use terms described by COC to INPUT.
- COC has not attained an "image" in these industries as providing general purpose solutions thereby being at a competitive disadvantage.

However in spite of all this Input did develop a 2nd Tier of candidates for industry focus based on evaluating the overall capabilities of COC and matching them with the applications potential in the 2nd Tier

industry segments. The second tier industry segments are DISTRIBUTION (Retail and Wholesale (mostly wholesale)), State + Local government and Telecommunications. These industry segments do have an "operations" flavor that is compatible with CDC's internal CSI capabilities and selective marketing efforts could be used effectively.

Input believes each of these industry segments could be developed by picking a couple of applications that CDC can master and propagate them much like Energy management, Lottery systems and Credit Union services have become. For example in State + Local government the pilot efforts in mapping using the scanning services capabilities could catapult CDC into providing mapping services ~~for~~ In Telecommunications, operator scheduling and accounting systems is an application that seems compatible with CDC's skills and in Distribution the scheduling of routes and product distribution would be an example.

In the following sections the 2nd Tier and remaining industries are presented to allow CDC to obtain additional insight

A. DISTRIBUTION: Retail and Wholesale

1. Driving Forces

- The use of various types of computer systems and digital communication networks have allowed wholesale distributors

to adapt their modes of operations to the specific needs of the industries they serve. These various adaptations have led to a rapidly increasing market for customized turnkey systems in the wholesale distribution industry.

- Turnkey systems have always been, and are likely to be, an important part of the wholesale distribution industry.
- In the retail distribution sector, the requirement for advanced inventory control systems and the support of point-of-sale terminals has become important in the market for integrated services.
- There is a direct systems link between point-of-sale systems and inventory control systems. Each retailer seems to look upon his requirements for these combined systems in a different way.
- Even small retailers have been, through competitive pressures, forced to automate their operations. While a small retailer normally cannot afford high levels of information services expenditures, it may still be necessary for them to purchase a customized turnkey system to support their retail operations.
- Product and market diversification and geographic expansion will be key activities for wholesale distributors during the course of the next five years. Data communications and integrated systems will be a leading factor for this type of application.

2. Current Applications

- Small Store Inventory Management

- These systems maintain perpetual inventory control for single store or multi-store locations. The systems process daily sales and provide daily, weekly and monthly sales analysis and statistics. The system also process delayed shipments and backorders, as well as produce mail lists, letters of credit and sale acceptance documentation. The systems typically interface with point-of-sale cash registers for the entry of daily sales.

- Retail Merchandise Control Systems

- This system provides merchandise control, including a purchase journal, analysis reports for merchandise transfers, mark-downs, price changes - etc. It also provides sales order entry data and summarizes daily sales, by store and cash register, and provides for cash balancing at the end of the sales day. The system may also provide for the interface of POS systems. It also may interface to a general ledger, accounts payable and/or payroll system

- Small Distributor Multi-Warehousing Control System.

This system can provide single warehouse or multi-warehouse control systems for small distributors and also allow for inventory transaction editing and posting either on edit list and ~~&~~ journal. The system provides a detailed LIFO/FIFO cost history. It also

added to retail and wholesale distribution in key applications.

- EDI Systems

The requirement for a comprehensive electronic data interchange (EDI) system within the distribution industry is extremely pressing. The need to rapidly pass electronic records representing various types of transactions within the industry and between the distribution industry and banking is crucial. The systems integrator who can design, and install an EDI system for the distribution industry will find a strong demand for his network products. Since CDC has a processing service for EDI (i.e. EDINET) it stands to reason that it could be a strong possibility for that CSI vendor role.

- Point-of-sale systems

- These systems are important in both the wholesale and retail portions of the distribution industry. To date, POS systems have gained greatest acceptance in the retail industry, but are now becoming more prevalent in the wholesale distribution industry as well. The need to enhance these systems and integrate them directly with inventory control and inventory planning systems, remains as a key future application.

typically includes price list, stock status, inventory value, purchasing advice and usage reports

3. Examples
   - Inventory Control
   - Merchandising Information System
   - Store Business System
   - Warehouse Control
   - Network Integration
4. Future Application Projects
   - Store Resource Management System
     - Plans, reports and controls how people and equipment resources are used within a retail store environment. Maintains daily sales and percent distribution of sales for different time periods during the sales ~~day~~ day. Also it maintains a history of customer and item count by selected time periods during the selling day. May keep a history of customer service by recording average and maximum number of customers awaiting service at check-out positions. In general, these systems allow various store areas to compute fixed and variable manpower requirements by time-of-day and can create departmental employee work schedules
   - Retail Store Inventory Management System
     - This system works in conjunction with an overall

inventory management system and is basically oriented toward tracking markdowns and sales of markdown items for various periods of time. It prints audit trails, inventory report stock item status and markdowns by specific vendors and specific departments. It is basically aimed at allowing a discounter, or a normal retailer entering a discount market, to control and ~~profit~~ project discounts and compare profit margins as items are discounted over time.

o Warehouse Control Systems

- The systems support the entry, maintenance, packing, shipping and tracking of sales orders. They may be designed to handle multiple warehouses, multi-~~company~~ company, multi-region and multi-division capabilities. These systems are applicable to both wholesale ~~retail~~ distributors and the distribution function within a manufacturing organization. A current key element is the use of these systems in various field locations, on a turnkey basis, with feedback to a centralized system at the ~~corporate~~ corporate location.

B. State and Local Government

1. Driving Forces

• There is a strong degree of commonality in information systems applications throughout both state and local governments. Their functions are essentially the same and operations

in function, from one level of government to another are not significant.

- While State and Local governments, in particular, local governments were among the last industry sectors to automate the degree of automation even at the local level, is currently quite extensive
- State government are heavy users of mainframe computer equipment and tend to be centralized in their data processing applications

- Local governments, except for major cities, are more oriented toward mini- and microcomputer application In many cases, state and local information systems exclude applications from other industry sectors; for example health, education and utilities.
- Because of standardization and budgetary limitations the S+C government sector is, on a proportional basis, one of the lowest ranked users of customized software services.
- Whatever the application, in almost every case, S+L governments are required by law, to engage in competitive bidding for any type of information system.

2. Current Applications
   - Revenue and Expense Projections

These systems are used to develop a profile for a Municipality's revenue stream from taxation and associated sources. They include residential, commercial and other types of property, from both an assessment and tax generation perspective. These systems also frequently include tax valuations and the ability to project new valuations and tax receipts for each specific property and type of property. Where appropriate water and sewer revenues and expenses are included.

- Tax assessment and Collection Systems
  - These systems are, in essence, a real and personal property tax administrative system. They include property appraisal, assessment and billing functions.
- Building Permit Processing Systems
  - These systems provide the storage and retrieval of building and other permits as they are administered by local governments. The systems normally handle residential, commercial and industrial building permits, as well as electrical, mechanical, plumbing and other types of permits. The systems typically calculate fees, determine critical dates and track various types of permit review functions
- Municipal Utility Billing
  - These systems handle metered electricity, water, sewer, garbage and other types of utilities monitored

- provided by municipal governments

- Vechicle Registration System
  - These systems can be either batch, or on-line and encompass the recording, maintenance and reporting of information concerning registered vechicles. These systems are designed to allow the reporting of information to the vechicle registrar about vechicle registration, vechicle lists and a projection of vechicles to be registered by month for varying times into the future

- Municipal Court Scheduling System
  - develops and prints court docket schedules by court date, session and type of court. These systems typically provide history tracking for each type of violation and type of court case. The systems also monitor track and report on the payment of fines, sentencing, probation, etc.

3. Examples
   - Driver Registration System
   - Child Support System
   - Expenditure Management System
   - Social Services Client Data Base
   - Voice/Data Intigration.

4. Future applications

- Fund Accounting Information Systems
  - These turnkey systems are on-line, interactive accounting/cash management systems. Typically, they include general ledger, budgetary accounting, accounts payable, vendor management, grant/project accounting, cash receipts, encumbrance control, etc. They are also able to generate checks and 1099 forms for various types of public service agencies.
- Budget Modeling Systems
  - These are on-line forecasting and budget preparation systems for state and local governments. They provide current and historical data for use in preparing budget requests.
- Fiscal Modelling Systems
  - The more complex and complete systems that are under development include the creation and maintenance of all line item accounts, tables, program descriptions and allocation basis and tend to provide historical information in support of a financial modelling process.
- Crime Analysis Systems Support
  - Supports the crime analysis needs of various types of law enforcement agencies. Provides the user with the capability to do crime pattern detection, crime/suspect correlation, target profiles, crime potential forecasting and exception reporting.

c. Telecommunications

1. Driving Forces

- The increased density in the U.S. telecommunications market has led to the requirement for more sophisticated tools to plan and manage new communications channels such as satellites, fiber optics and new types of data networks. The recent upheaval in the telecom industry in this country and the resultant mergers and acquisitions, consolidations and deregulatory activities are creating significant new opportunities for information services vendors.
- By its very nature, the telecom industry has always been capital intensive.
- The various types of telecom organizations have been early and substantial users of information systems services.

2. Current Applications

- Telephone Management Systems
  - These systems includes call costing for individual users and the ability to output related data. These systems compute the cost of calls, ~~dialed~~ identifiable by station and/or extension. These systems also store commonly used names, addresses and phone numbers for speed dialing and provide for the automatic activation of discount long distance service.

- Network Design and Management Systems
  - These systems provide automatic design and management for distributed processing configurations and also provide a database management system for the inventory of equipment, lines and network design. They provide design, management, analysis and optimization of distributed processing networks for both simple and multi-stage network design. They give the user the ability to design all or part of a network and design telecommunications topology for geographically diverse data networks.
- Telephone Traffic and Accounting Systems
  - These systems process station message detail records and exchange message record formats. They also enable the vendor to develop customer charges and allocate these charges as a percentage of the direct dealing rate. These systems are typically ~~categorized~~ categorized into two separate areas:
    - Billings and Accounts Receivable
    - Traffic and Network Analysis

3. Examples
   - Office Automation
   - Customer Information System
   - Voice/Data Network Integration
4. Future application Projects
   - Automated Billing Financial and Administrative Systems

- These systems are newly designed to support cellular radio systems, as well as long distance and local telephone networks. They process call detail record data, pricing and invoice production with an interface to accounts receivable packages. Systems under development also provide for on-line correction of errors, database updates, traffic statistics and on-line management reports.

• Online Data Collection Using Portable Data Collection Terminals

- These systems provide for a variety of input devices including unattended 24-hour remote data ~~device~~ devices via multiple telephone lines. Bar code readers may be attached to portable storage terminals. The systems are designed to be used in industrial, retail and distribution applications. Typically, these applications include remote order entry, inventory data collection, manufacturing item control, branch location reporting, retail sales reporting, etc.

• Cost Allocation Traffic Analysis Systems

- These consist of a series of data base management modules, each module designed to perform a specific task in accumulating and organizing telephone data for decision making and the control of telephone and telephone-related expenses. The systems provide cost

allocation capabilities, budget performance, flexible reporting and historical expense structures.

The above three industry segments described the 2nd tier of industries that lend a fit for CDC based on ~~its~~ CDC's entered skill set and the inherent nature of applications that are mission critical and operations-oriented.

The following industry segments complete the major industries monitored by Input as part of the commercial systems integration activity. CDC may be able to develop an application system that could represent an important thrust in these industry segments on an opportunistic basis. Input does not recommend that CDC force itself into these industry segments based on the information it currently has in ~~its~~ possession.

D. Insurance Industry

1. Driving Forces

- The insurance industry can be subdivided into four sectors:
  - Life Insurance
  - Property/Casualty Insurance
  - Health Insurance
  - Reinsurance

- The insurance industry is highly regulated; this is true for each of the various subsectors within the industry.
- While an important part of the U.S. economy, the insurance industry has been one of the least dynamic industries throughout its history
  - The major competitive threat to organizations in the insurance industry is that of being acquired by other companies who are attempting to form complete financial services organizations
  - Cost control, especially in the life insurance and property/casualty insurance areas, has become an important focus for the major insurance carriers. Cost control normally focuses on the company's agency structure. Many insurance carriers are finding ways to reduce the number of agents and agencies, through consolidation and attrition

2. Current Applications
   - Financial Needs Analysis Systems
     - These systems are utilized by insurance agents and can calculate the amount of insurance required for cash and income requirements. The systems typically include Social Security benefits and user designed interest and inflation assumptions.
   - Claims Management Systems
     - These systems include credit insurance administration and state reporting requirements. They maintain files of

credits, withdrawals, unearned claims and disability, life and mortality factors

- Group Administration Systems
  - These systems capture data regarding policies, subpolicies, billing groups, agents, class descriptions and coverage data. They generate renewals listings, notices, premium bills and late and lapsed listings. These systems are basically designed for the administration of group insurance policies.
- Claims Processing Systems

  These systems perform the following functions:
  - Verify claim eligibility
  - Claim pricing
  - Benefit calculations
  - Determine the applicability of deductable limits

  Typically these are family systems and they interface with a variety of other systems, both at the agency and corporate levels.

3. Examples
   - Insurance Agent Automation
   - Communications Network Development
   - Flexible Life Insurance System
   - On-Line Customer Information System
4. Future Application Projects
   - Customer Information Systems

The insurance industry is beginning to express an interest in developing on-line customer information systems, similar to those that are already in use in the banking industry. These systems will allow single file access to all customer policies and activities, rather than accessing customer's policies within each product line, as is now normally the case.

- Interactive Loss Analysis Systems
  - These systems analyze various types of insurance losses and provide for automatic take-down and release calculations. The systems report loss by product line, state, type of policy, etc. They also enable the user to maintain loss and expense information, separately and by product line.
- Turnkey Agency Management Systems
  - These systems are basically oriented toward the independent insurance agency. They provide for client profiling, prospecting and solicitation capabilities, and sales analysis reports. There are also agency accounting applications, client file and policy information, together with the ability to generate new policies and proposals on an on-line basis.
- On-Line Quotation Systems
  - These systems are designed to enable the corporate agency, or the independent agency, to generate quotes and proposals for insurance policies on an on-line basis.

they include the calculation of premiums, a word processing capability and the ability to access databases for direct mail capabilities

E. MEDICAL Industry

1. Driving Forces

- The medical and health services sector has changed dramatically during the past several years. The current emphasis on cost containment and the type of reimbursement plans for health services have caused great changes in the health industry itself. These changes have, in turn, had a marked effect on the information services aspect of the medical and health services industry
- More efficient and complex information services have become more in demand, in order to support the reporting associated with health care reimbursement.
- There has been an increase in the diversity of health care organizations. For example, Health Maintenance Organizations (HMOs), together with pre paid plans, home health agencies and free standing emergency centers, have all added to the complexity and diversity of the health care industry
- While hospitals continue to be the primary vendors of health care services, their relative degree of importance is declining rapidly.
- Conversely, where, in the past, the individual medical

practitioner had been the mainstay of the medical industry, the individual practitioner is now being displaced by group practices.

- A new factor in the medical and health service industry is that of competition. Hospitals and other health care organizations are, now, more than ever, competing for patients and for physicians. Information systems could be a determining competitive factor in ~~enabling~~ establishing the level of health care service a particular institution can provide.

2. Current Applications
   - Image Analysis Systems
     - These systems include the analysis of the many types of biomedical images, metallographs, X-rays, autoradiograms, and electrophoresis gels. They allow measurements in two- and three-dimensional features. The systems typically print values for later analysis by the medical practitioner.
   - Medical Billing Systems
     - These systems encompass billing, collection and statistical gathering for all types of medical practice. The systems are frequently custom tailored for specific medical specialties such as radiology or pathology. They enable the accumulation of charges until patient discharge. In addition, these systems are able to generate specific customized messages on statements, dunning letters, and optional write-offs on certain accounts. Many of these systems

also include management reports, patient and insurance statements and a detailed audit trail.

- Long Term Care Resident Management System
  - These are turnkey systems which pertain to health care facilities. They include admissions, discharge and transfer applications, as well as the generation of patient census days, revenue and census tracking, by billing and patient type. The systems are typically able to build variations such as room and board charges, ancillary charges and other types of charges pertinent to the individual health care facility. They typically interface with general ledger and Medicare/Medicaid types of insurance billing systems.
- Health Care Cost Accounting Systems
  - These systems are normally applicable to hospitals or other types of complex patient care facilities. They facilitate the development of costs for each service unit in the health care facility. They are able to monitor the activities in the health care facilities by department and produce dollar volume and dollar variant figures by department.

3. Examples
   - Hospital Information System
   - Automated Diagnostic System
   - Patient Billing System
4. ~~Real~~ Future Application Projects
   - Automated Diagnostic Systems

- There are a series of systems under development which will run differential diagnoses on any combination of 300-400 common, acute diseases or conditions. These systems typically incorporate a disease reference module which displays symptoms associated with any of the stored diseases. It is able to compare the input of symptoms with stored symptoms, by disease, and print out diagnoses and references for the aid of the internist, or other health care practitioner.

- On-Line Patient Information Systems
  - These systems, under development, provide on-line access to historical patient information. They extract data through an interface to a patient data management system and provide a reference for the medical records department concerning all data pertaining to patients. The systems are also able to establish a retrospective statistical study for the health care institution and provide data to the business department or regulatory agencies.

- Health Care Financial Management and Modelling Systems
  - There are a variety of turnkey systems which provide financial support to the administrator of a health care facility. These systems are basically made up of three separate modules:
    - a budgetary module, which handles expense, revenue and labor and payroll budgeting and monitoring
    - a reimbursement and profit and loss modelling system
    - a report generating module for state and federal regulatory filing

These systems can generate budget systems, pay or reimbursement analyses, profit and loss forecasts and reimbursement maximization possibilities.

F. Services Industry

1. Driving Forces

The Services Industry, as defined by Input, consists of the following segments

- Accounting
- Legal Services
- Architectural and Engineering Services
- Real Estate
- Business Services
  - Business Consulting
  - Advertising

- Mathematical modelling of the economy and of business problems is an important aspect of the use of computers in the business service subsector
- The unifying feature in the services subsector is that the product is people-oriented and labor intensive. Therefore, computer applications in the services industry focus on improving personal productivity.
- Computers are enabling the accountant to change from a strictly financial role to a more sophisticated analytical and advisory role.
- The real estate subsector is becoming more dependent on computers for marketing, as well as for management functions.
- The computer services subsector of the services industry is

more of a provider of information services than a consumer of information services

2. Current Applications

- Advertising Management Systems
  - Designed for small to medium-sized advertising agency and public relations firms, these systems include a variety of functions such as:
    - Time/media billing
    - agency business analysis
    - Project estimating
    - Financial applications, such as accounts receivable, general ledger and budgeting.
- Media Scheduling Systems
  - These systems establish media schedules at the beginning of a media plan year and track budgeted ~~cost~~ versus projected costs and activities.
- CPA Client Write-up Systems
  - These systems provide financial statements for each client, including audit trails, batch balancing and, where appropriate, after the fact payroll.
- Practice Management
  - Most professional organization in the services industry require the use of some form of practice management system. These systems keep track of time and expense, by professional employee, and provide an objective criteria for evaluating both staff performance and client profitability

The systems usually include detail work-in-progress journals, work-in-progress reports, unbilled fees and a client service analyses capability.

o Litigation Support Systems

- These systems, developed for law firms, have the capability of searching names, dates, document types and characteristics and information describing deposition and trial exhibit numbers. They are used by group practices, or sole practitioners, to develop data to support litigation activities.

o Property Management Systems

- These systems are applicable to multi-unit real estate management companies. They provide property, leasing, rent control statistics, management reporting and cash flow analyses. They also will provide a detailed cost reporting capability together with vacancy reporting, notification of future vacancies, lease renewal notices, etc. Optionally, these applications can include payroll, job costing, financial modelling, etc; typically they interface with other systems providing these applications capabilities

3. Examples

- Local Area Network Development
- Legal Information Retrieval System

4. Future applications trends

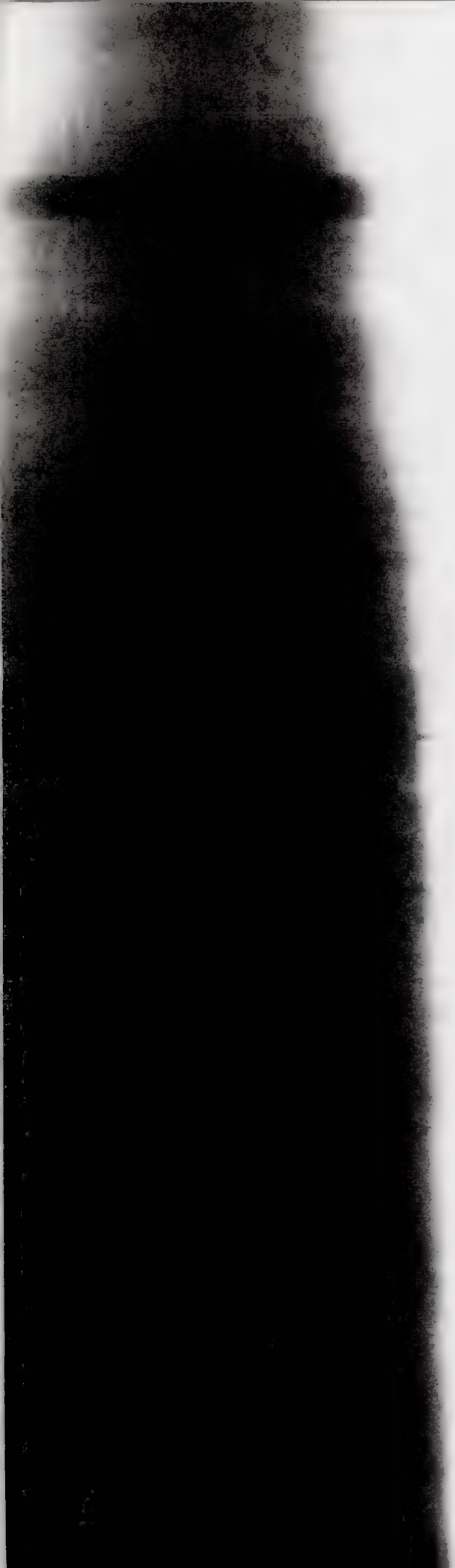
o Because of the great diversity of industries within the Service Industry sector, it is a practical impossibility to delineate what applications are being developed for the

this industry sector. As a sector, it is an agglomeration of various industries without any real correlation across industries, except that they are labor intensive

- As can be construed by the above statement, most new applications oriented toward the services industry are aimed at creating a more efficient labor force. This is true whether the particular organization is a professional services company, such as a law firm or CPA firm, or a real estate office or travel agency.

- The development and market acceptance of the microcomputer has made the automation of this industry a reality in the last 5-6 years. The industry is typified by small firms that are not able to afford a minicomputer or mainframe computer based system; thus the use of microcomputer based systems has become endemic throughout the services industry.

6. TRANSPORTATION Industry
   1. Driving Forces
   - De-regulation of this industry has contributed to increased competition and increased consolidation within each of the transportation segments, as well as causing increased competition among the various modes of transportation.
   - Since industry de-regulation has occurred, cost containment and increased productivity, together with



improved service levels, have become increasingly important in all phases of the transportation industry.

- The railroad industry continues to move toward fewer and larger railroads
- The airline industry has gone through several phases of consolidation and increased competition. The demise of Peoples Express has led to decreases in fare reduction pressures in the industry and thus, at least temporarily, the industry is returning to an era of fare stability.
- Several of the larger transportation companies have developed systems applications externally and are providing information services to other outside organizations
- While most transportation companies are capital intensive, the trucking industry is typified by a large number of small carriers. Therefore, while statistically attractive the trucking industry is, in many ways, the least attractive mode within the transportation industry segment for information services vendors.
- Recent advances in telecommunications technology, and costs, now allow ~~transportation~~ transportation companies to control their operations at the vehicle level.

2. Current Applications

Automated Truck Routing

- These systems produce driving routes, mileage, travel time and fuel usage for different pickup and delivery routes. They typically contain a database of a large number of cities, and road junctions, throughout the U.S. and compute the shortest route between cities. Variations involve avoidance of tolls and pay roads.

o Vechicle Maintenance

- These systems provide preventative maintenance schedules and historical cost for vechicle repairs. Maintenance can typically be based on mileage, hours, elapsed days or specific dates. Historical labor and material costs are typically maintained, and fuel usage reports are also generated.

o Flight Load Optimization

- These systems determine optimum aircraft load distribution and fuel loads. They also perform preliminary and final center of gravity calculations.

o MARKET Analysis Systems

- These systems extract summary data from on-line passenger service systems and analyze it to identify new markets, yields, revenue and traffic and earning data. They are normally applicable to airline operations but can be applied to both bus and railroad operations as well.

3. Examples

- Automated Train Control

- Office Automation
- Expansion of an on-line Reservation System
- Personnel System
- Reservations System Development

4. Future application Projects

o Equipment Management Systems

- These are turnkey systems to provide maintenance and operating data for fleet management. These systems integrate vechicle repair orders, parts inventory, labor and fuel costs. They track the fixed and operating costs associated with each vehicle in a fleet. They can schedule preventative maintenance as well as report on depreciation, vechicle class analysis, etc.

o Cargo Movement Control

- These are applicable to both air and surface transportation companies. They enable the user to determine both the location of any shipment as well as its movement throughout the transportation system. They are also able to predict and control available space together with reserving and allocating this space to cargo shippers. More advanced systems generate waybill data and reports concerning the utilization of the resources with the transportation system

o Integrated Preventative Maintenance Scheduling System

- These are preemptive maintainence scheduling systems for equipment and vechicles. They use mobile data collection devices, including pick input devices as

electronic data collectors at service islands to collect key daily servicing data. The systems are capable of generating daily reports including preventative maintenance schedules, vehicles not serviced, defects, vehicle fuel efficiency and warranty reports

- Transportation Route Modelling
- This enables a user to develop a set of supply points and customer demands and adjust the transportation network to optimize the relationship between customer demand and the transportation supply points. It is used to develop the quickest, shortest or least expensive way for travelling or for shipping an item between two points where there are multiple paths between the origin and the destination.

H. "Other" Industry

The "Other" industry segment is an accumulation of essentially miscellaneous U.S. Department of Commerce SIC codes to include the rest of the U.S economy. It consists of many small splinter industry segments such as not for profit organizations, museums, charities, etc. Input has not observed any of these organizations having the material need or benefit of a commercial systems integration project.

DIRECTIONS IN LARGE SYSTEMS INTEGRATION

SCOTT McCORD, Principal

BOOZ•ALLEN & HAMILTON INC.

DIRECTIONS IN LARGE SYSTEMS INTEGRATION

- Define Overall SI Market
- Quantify Market
- Analyze Competitive Forces
- Market Direction

Market Dynamics . . .

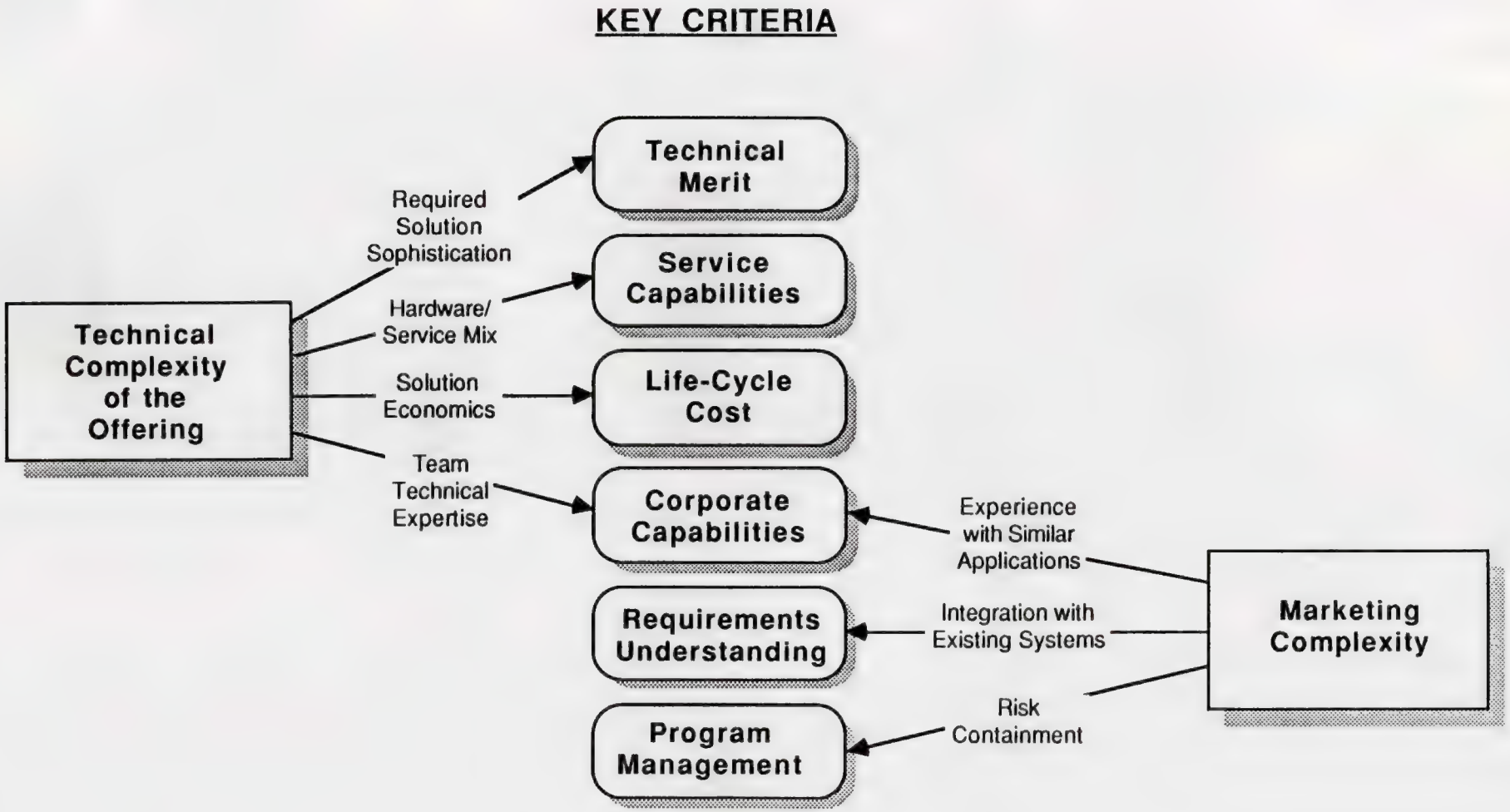
FEDERAL GOVERNMENT CUSTOMERS GENERALLY EVALUATE SOLUTIONS BASED ON SIX KEY CRITERIA

KEY SELECTION CRITERIA
SYSTEMS INTEGRATION CONTRACTS

Technical Merit	• Is the proposed solution feasible? • How well does it meet agency requirements?
Service Capabilities	• Does the solution provide adequate services to support implementation? • Are the services of sufficiently high quality?
Life-Cycle Cost	• Is the solution cost effective, both on an initial cost and on a systems life-cycle basis?
Requirements Understanding	• How well does the offeror understand the agency/organization, its functions, and needs? • Does the solution adequately deal with the required interfaces to existing agency systems and processes?
Program Management	• Is the proposed team capable of delivering on-time, within budget? • Will the proposed approach adequately contain program risks?
Corporate Capabilities	• Does the team have the right set of skills to get the job done? • Does the team have relevant experience?

Market Dynamics . . .

THE VARYING REQUIREMENTS OF THESE CONTRACTS CAN BEST BE EXPLAINED BY TWO UNDERLYING DRIVERS



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Market Dynamics . . .

THE TECHNICAL COMPLEXITY OF THE OFFERING INCREASES LARGELY AS THE DIFFICULTY OF INTEGRATION INCREASES

TECHNICAL COMPLEXITY

LOW:
"Off-the-Shelf"

- Minimal systems integration and engineering required
- Stand-alone products, such as departmental processors
- Services usually limited to maintenance training

MEDIUM
"Limited Integration"

- Some systems integration and engineering required
- Usually single-site
- Perhaps multiple vendors
- Some developmental services required; however, usually stand-alone applications

HIGH:
"Multivendor Multisite Integration"

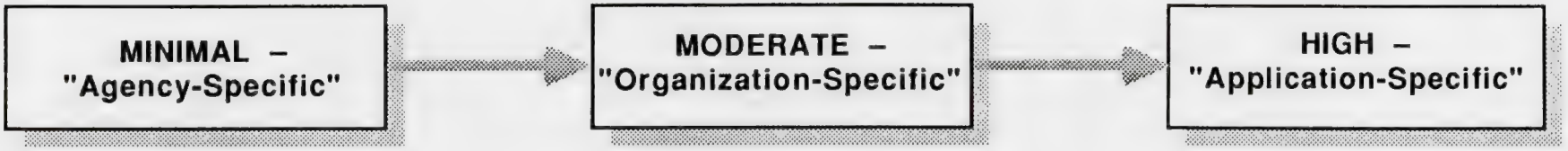
- Significant integration with existing systems
- Usually new to the world application, requiring significant development
- Typically multisite, with networked communications
- Often in a multivendor environment
- Many external interface standards

B10057(T)

Market Dynamics . . .

THE NEED FOR AGENCY AWARENESS INCREASES AS THE REQUIRED BACKGROUND KNOWLEDGE BECOMES INCREASINGLY SPECIFIC TO THE EXACT ENVIRONMENT IN WHICH THE SYSTEM WILL OPERATE

MARKETING COMPLEXITY



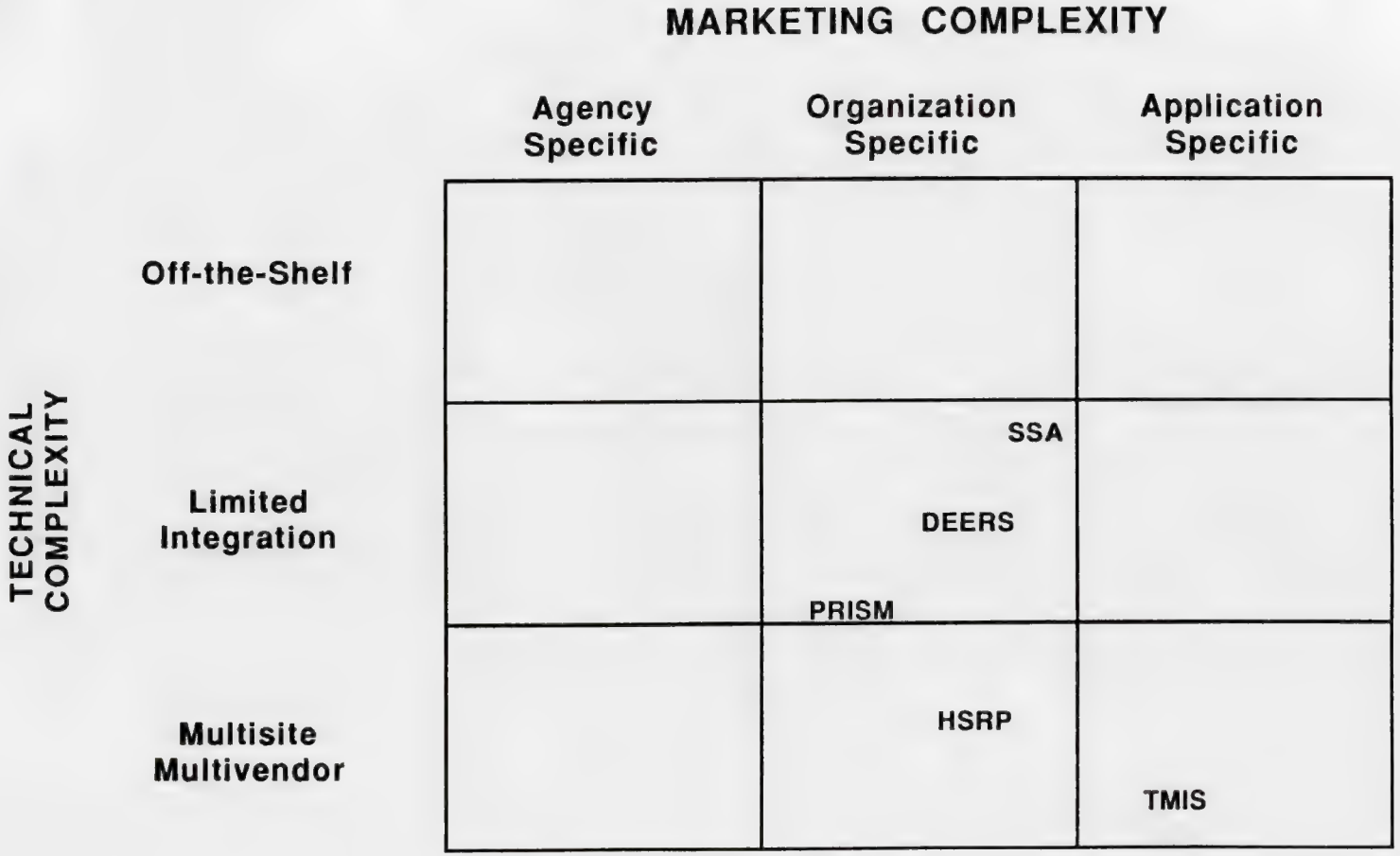
- General purpose products to be used throughout the agency
- Standard user interface
- Some knowledge of agency habits required

- Perhaps a unique solution
- Specific knowledge of organization needs required
- Usually some application-specific design elements

- A unique solution required
- Limited number of users
- Substantial interplay with existing data systems and organization

Market Dynamics . . .

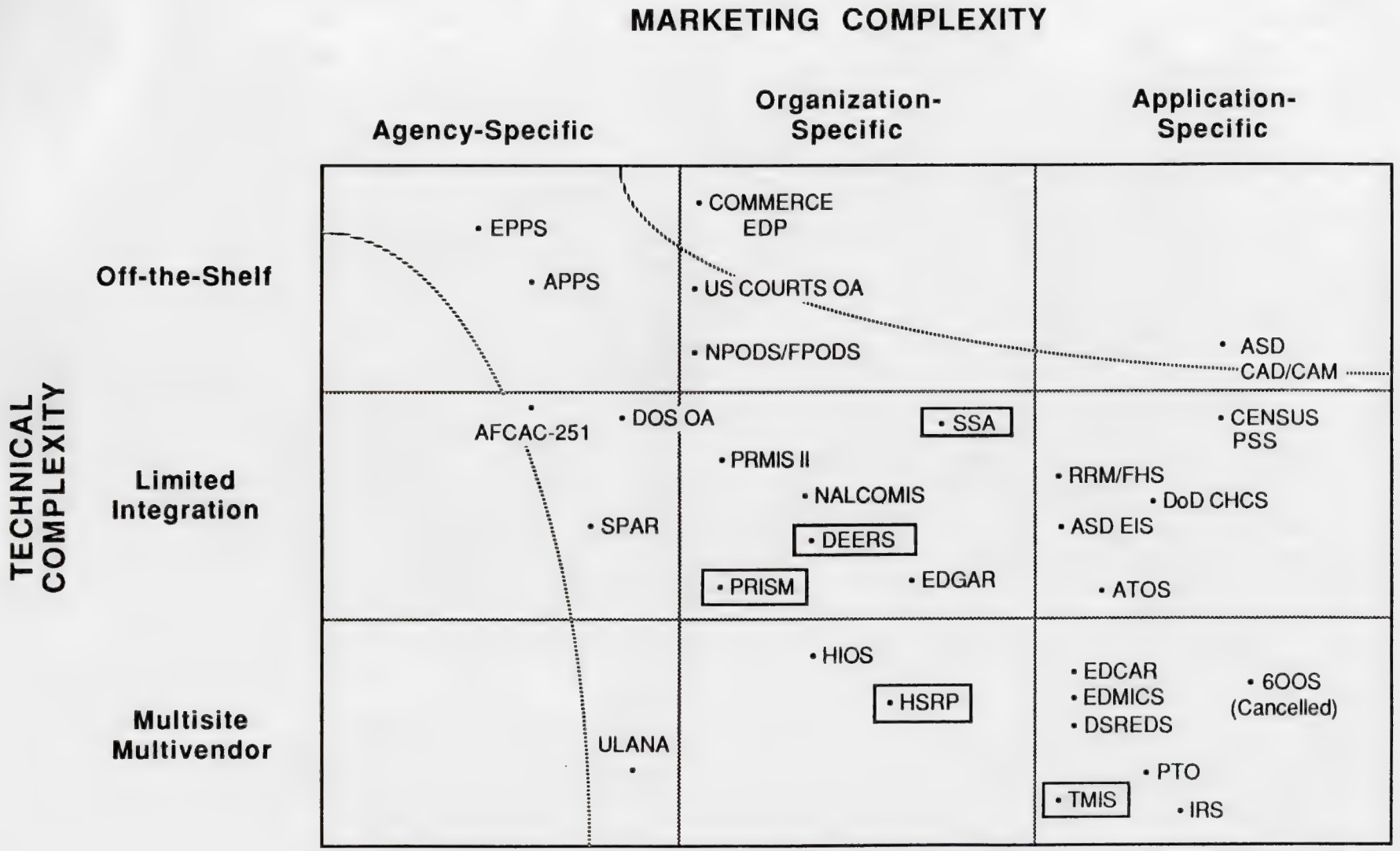
MAPPING THESE PROCUREMENTS AGAINST THESE UNDERLYING DRIVERS BEGINS TO EXPLAIN THE DIVERSITY OF THE MARKET



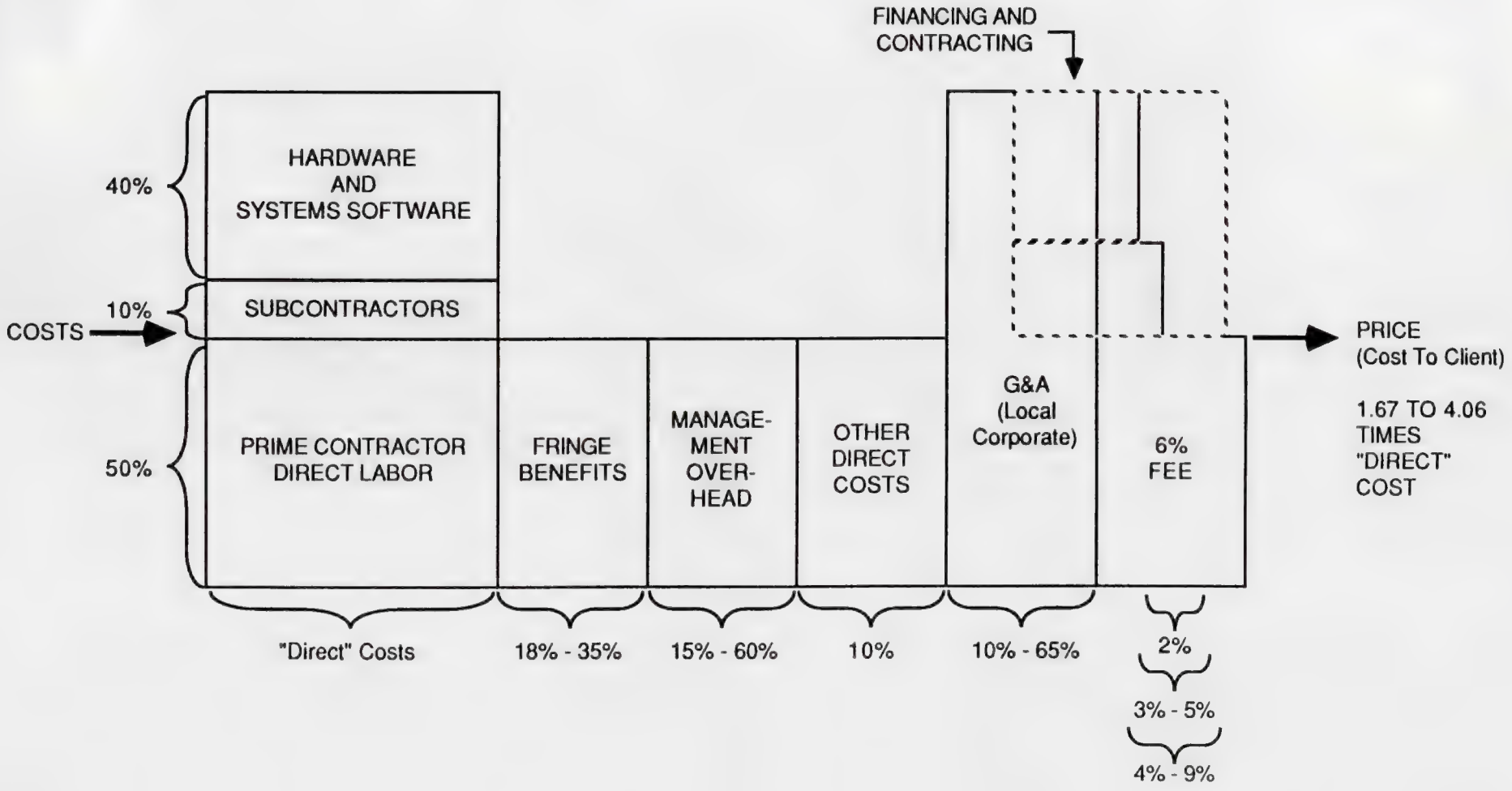
B10059(T)

Market Dynamics . . .

OTHER POTENTIAL INITIATIVES CAN BE POSITIONED SIMILARLY



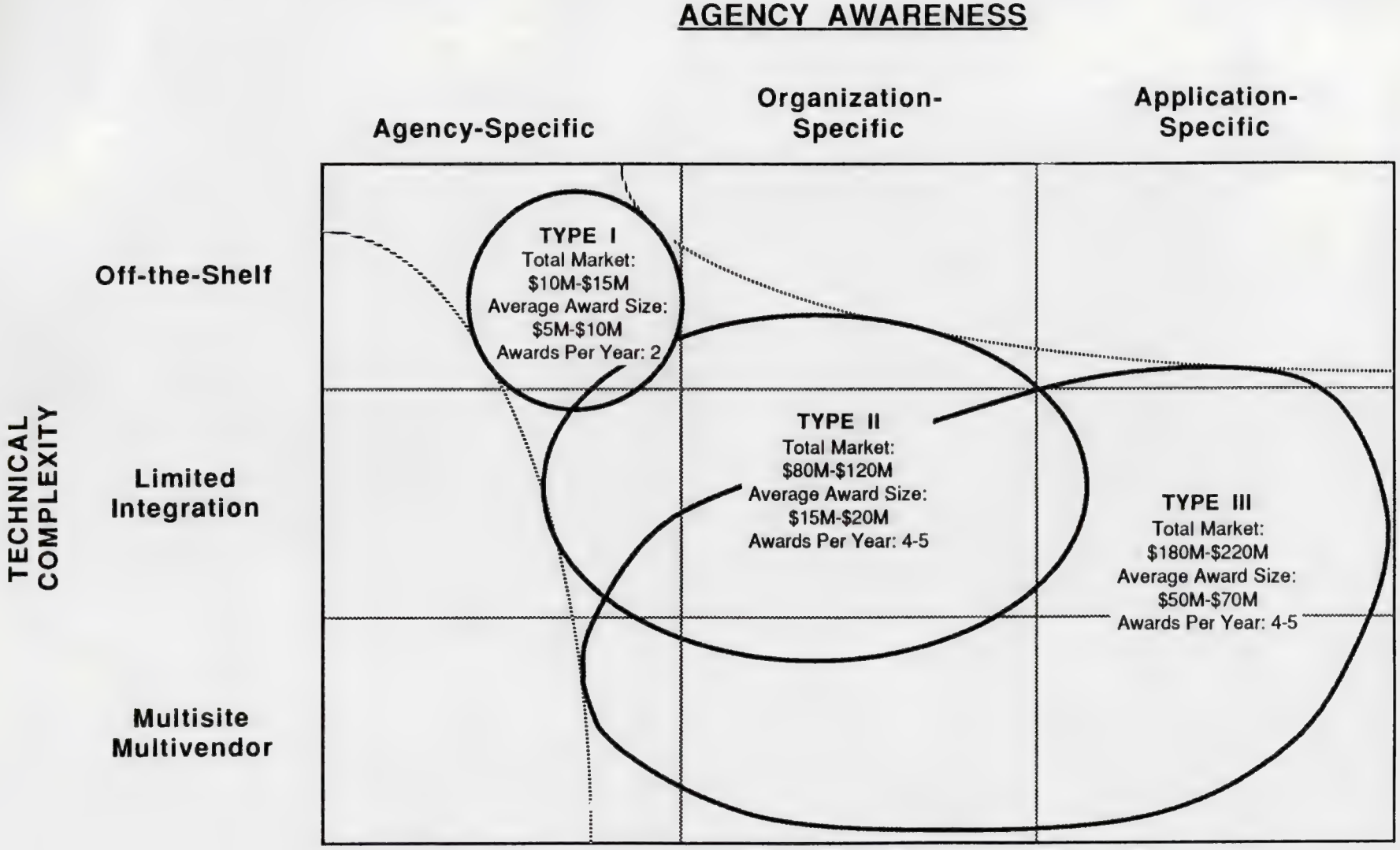
B10061(T)


FINANCING AND CONTRACTING
40%
HARDWARE AND SYSTEMS SOFTWARE
10%
SUBCONTRACTORS
COSTS
50%
PRIME CONTRACTOR DIRECT LABOR
FRINGE BENEFITS
MANAGE-MENT OVER-HEAD
OTHER DIRECT COSTS
G&A (Local Corporate)
6% FEE
PRICE (Cost To Client)
1.67 TO 4.06 TIMES "DIRECT" COST
"Direct" Costs
18% - 35%
15% - 60%
10%
10% - 65%
2%
3% - 5%
4% - 9%

B9721(G)

Market Dynamics . . .

THESE VARYING LEVELS OF CAPABILITIES BREAK THE MARKETING INTO THREE TYPES, EACH CHARACTERIZED BY DIFFERING LEVELS AND KINDS OF PROCUREMENT ACTIVITY

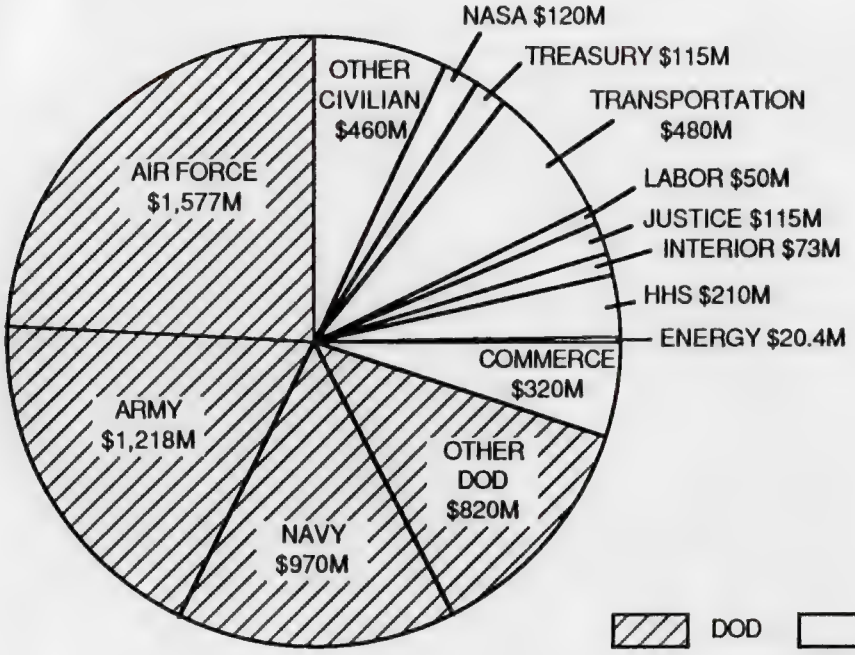


B10063(T)

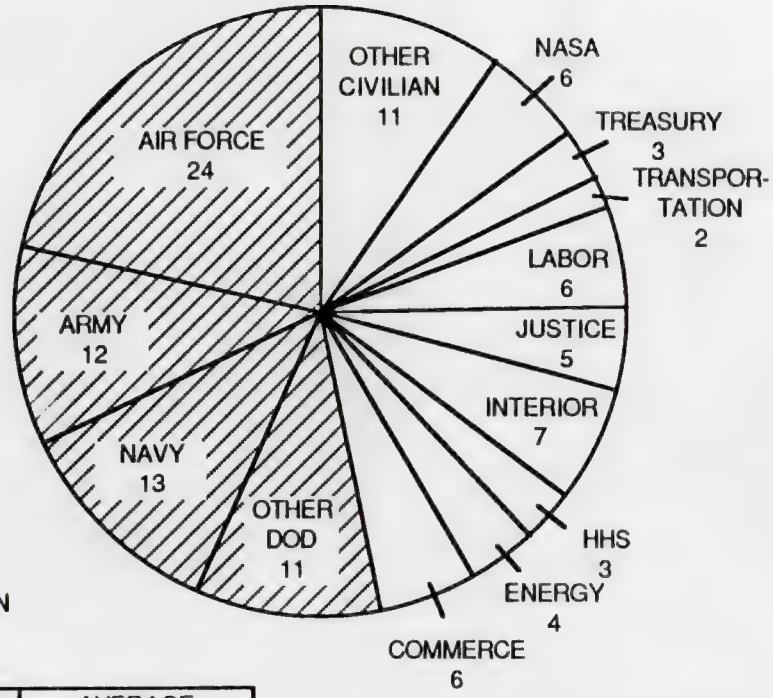
Market Dynamics . . .

THE PROCUREMENTS MAKING UP THE MARKET ARE HIGHLY DIVERSE — SOURCED FROM A WIDE RANGE OF FEDERAL AGENCIES

TOTAL AWARD VALUE ($M)
1982 - 1986



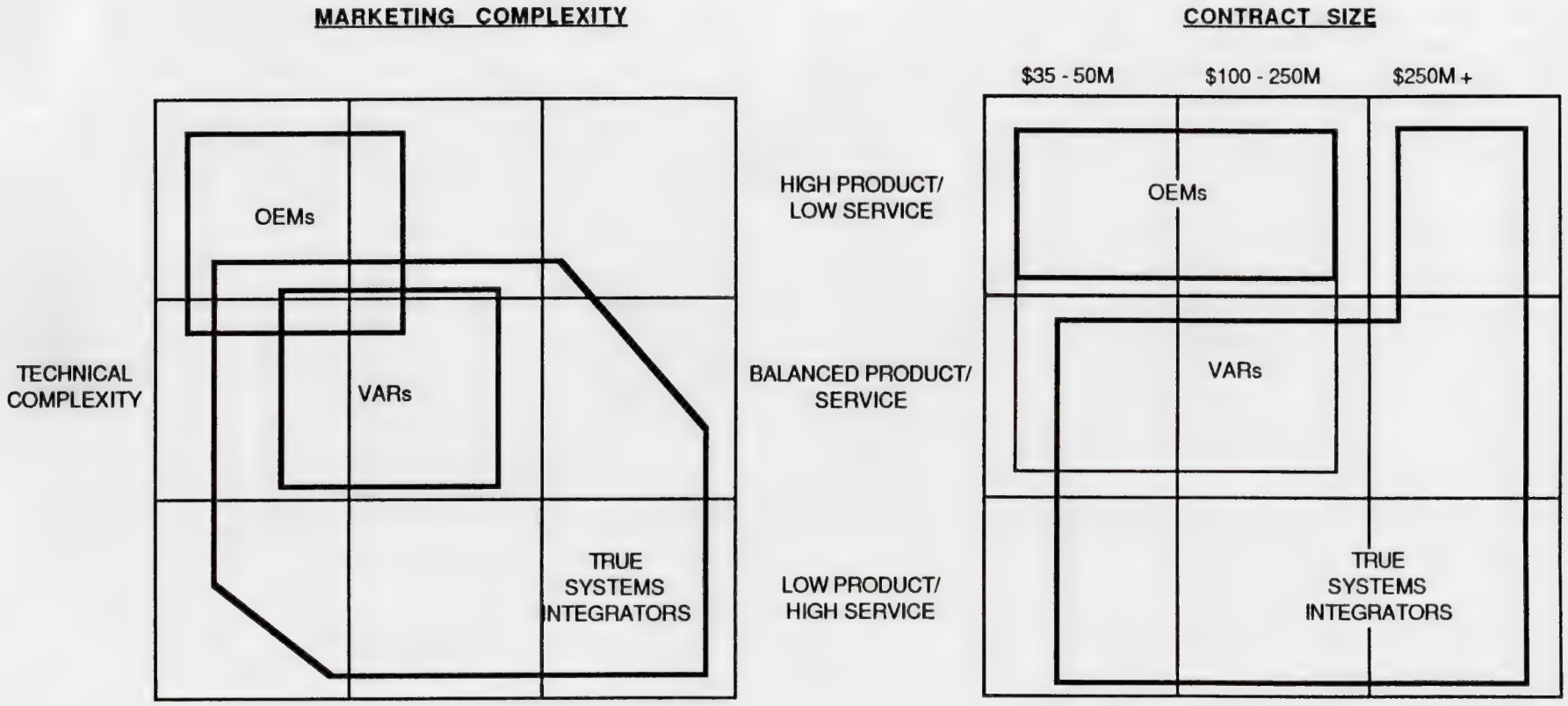
NUMBER OF AWARDS
1982 - 1986



	TOTAL AWARD VALUE	TOTAL NUMBER OF AWARDS	AVERAGE SIZE
DOD	$4,585M	60	$76M
CIVILIAN	$1,971M	53	$37M
TOTAL	$6,556M	113	$58M

B12120(A)

ZONES OF COMPETITIVE ADVANTAGE BY BUSINESS MODEL TYPE

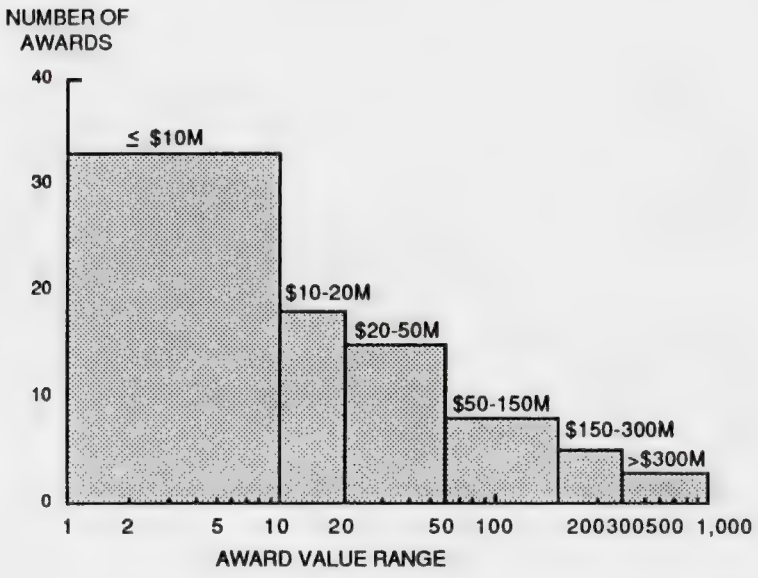


B10293(T)

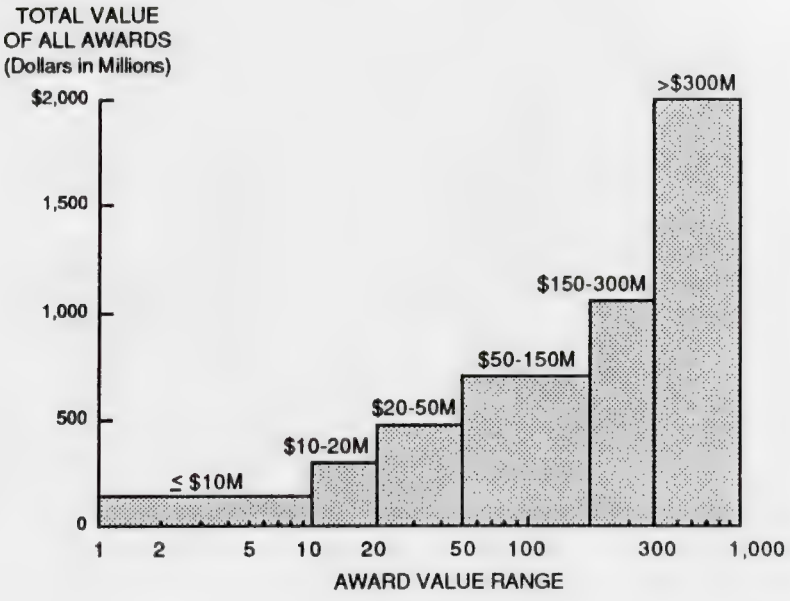
Market Dynamics . . .

. . . SPANNING THE RANGE FROM FAIRLY SMALL PROCUREMENTS TO VERY LARGE PROCUREMENTS

DISTRIBUTION OF SYSTEMS INTEGRATION AWARDS (1982 TO 1985)



DISTRIBUTION OF SYSTEMS INTEGRATION AWARD VALUES



Note: Excludes awards < $1 million in value. Total award value (dollars in millions).
Source: INPUT, Commerce Business Daily, Booz • Allen & Hamilton analysis

Market Dynamics . . .

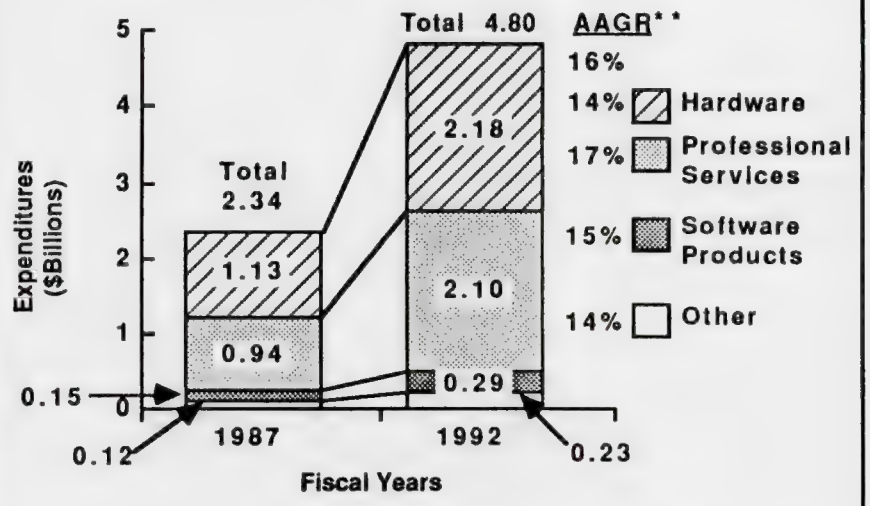
THE LARGE-SCALE FEDERAL SYSTEMS INTEGRATION MARKET IS CURRENTLY A $2.0 BILLION MARKET . . .

LARGE-SCALE FEDERAL SYSTEMS INTEGRATION MARKET*

FY 1982-1986

• Total Number of Awards	113
• Total $ Awards	$6.55B
• Average Award Size	$58M
• Total Average Annual Awards	$1.31B
• FY 86 Award Value	$1.6B

FY 1987-1992



** Average Annual Growth Rate

. . . AND IS EXPECTED TO GROW AT A 16-PERCENT ANNUAL RATE TO $4.8 BILLION IN 1992

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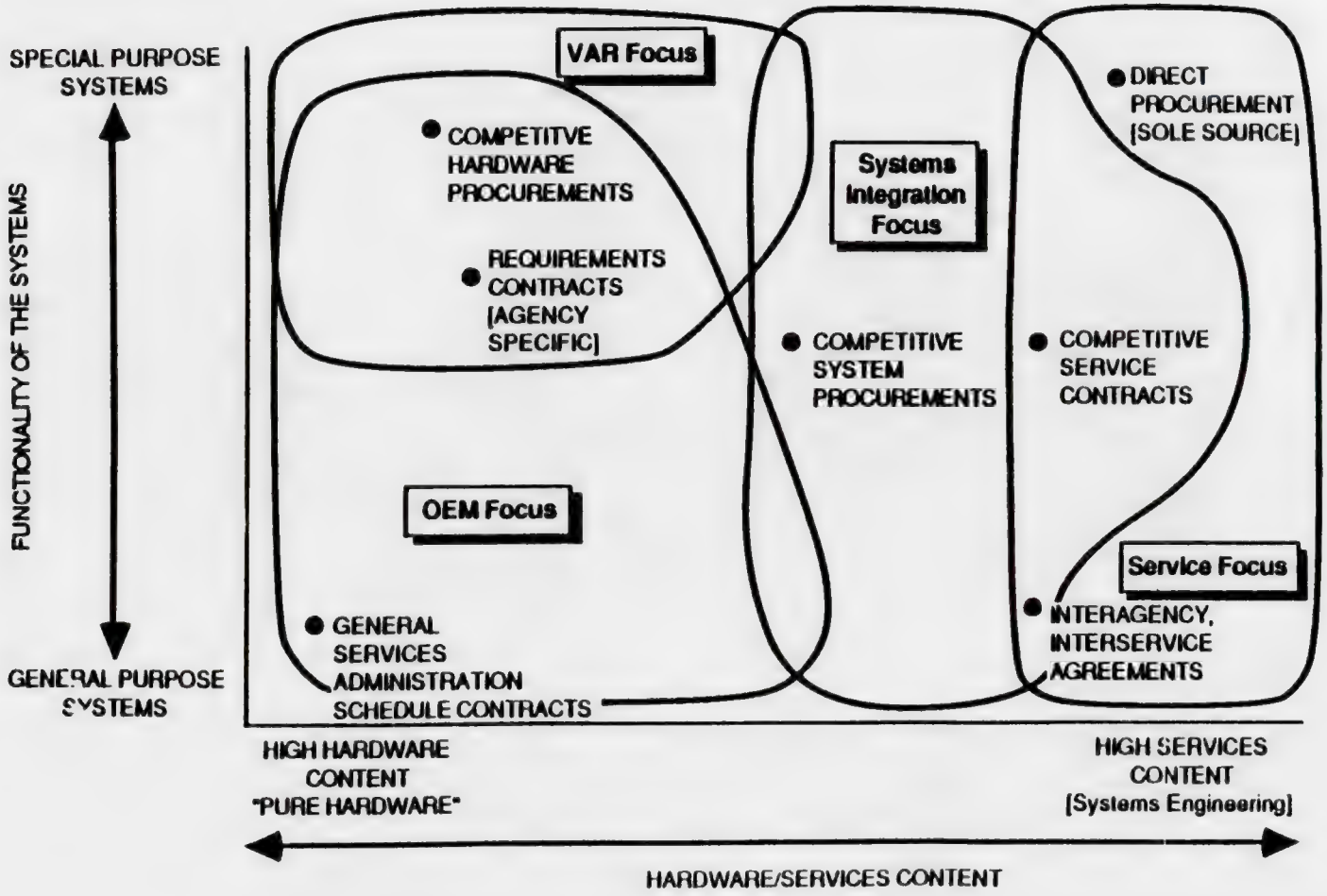
* Excludes procurements less than $1 million in award size.

Source: INPUT, Commerce Business Daily, Booz • Allen & Hamilton

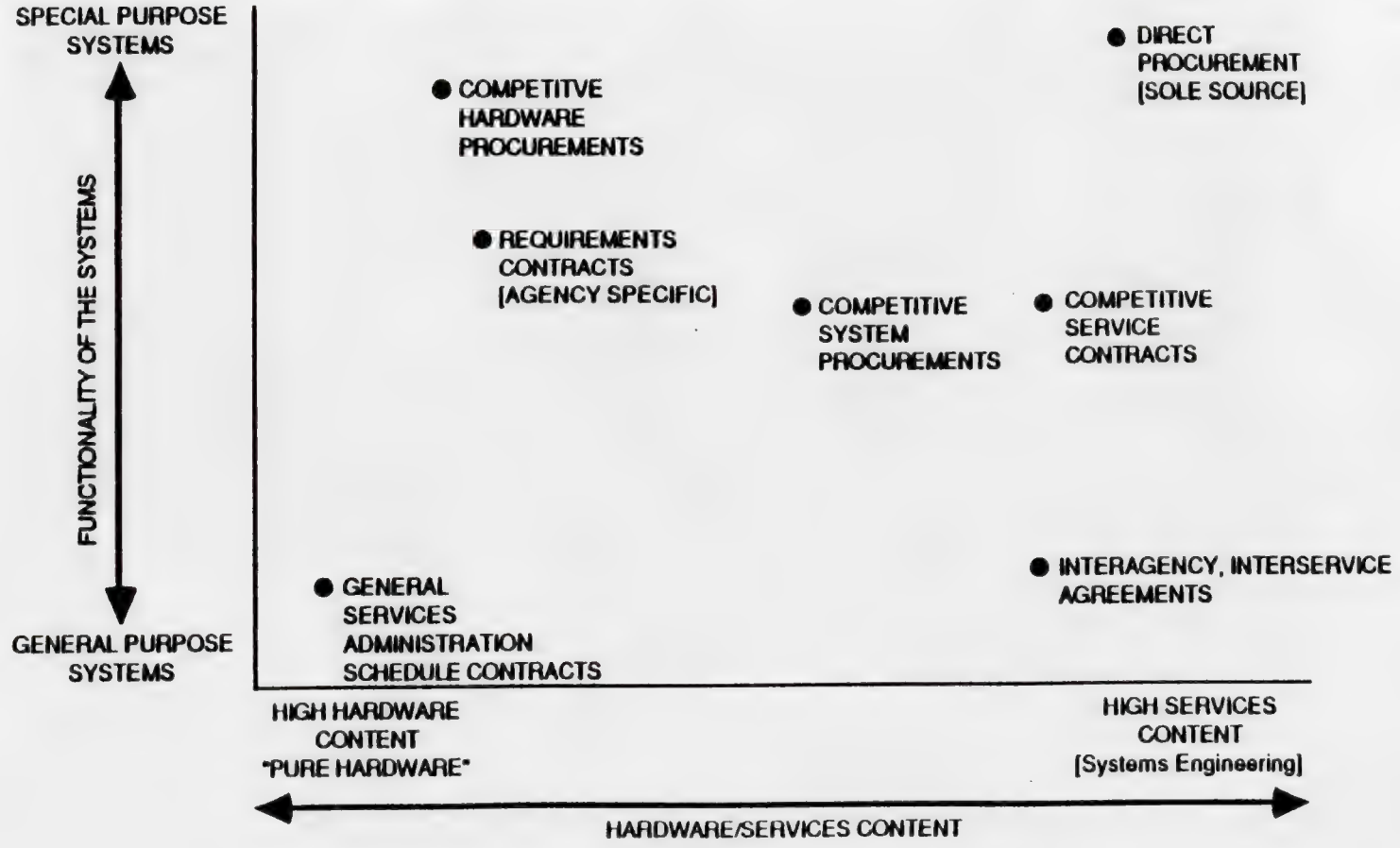
Market Dynamics...

THE VARIOUS SUPPLIER GROUPS HAVE STAKED OUT DIFFERENT TERRITORIES WITHIN THIS MARKET



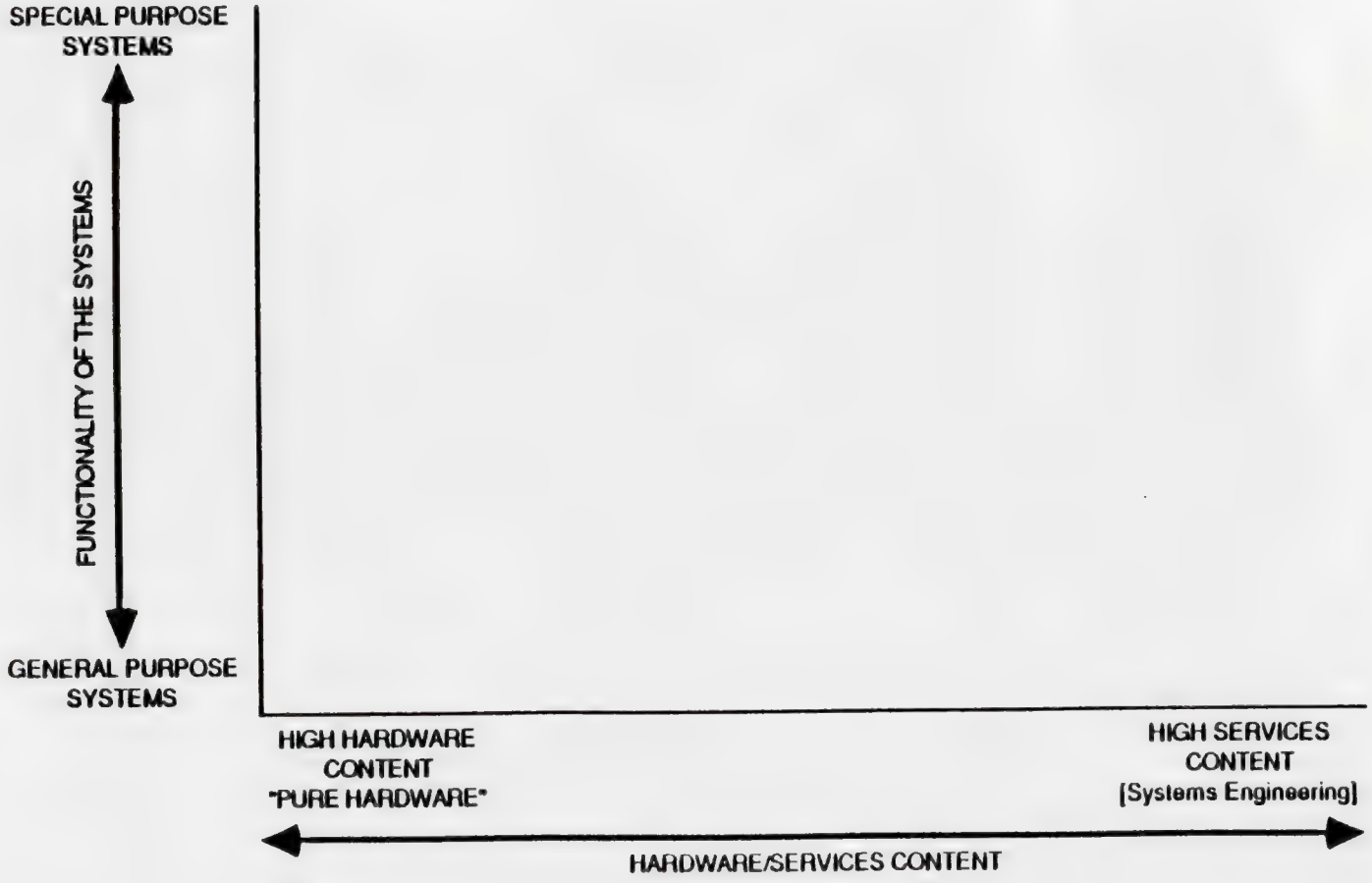
Market Dynamics...

...WHICH SERVE TO DIFFERENTIATE VARIOUS FEDERAL PROCUREMENT METHODS



Market Dynamics...

THE FEDERAL SYSTEMS MARKET CAN BE VIEWED ALONG TWO DIMENSIONS -- SYSTEM FUNCTIONALITY VERSUS HARDWARE/SERVICES CONTENT...



Market Dynamics . . .

VARYING CAPABILITIES ARE REQUIRED TO COMPETE IN EACH MARKET SEGMENT

AREA	FACTOR	TYPE I	TYPE II	TYPE III
TECHNICAL	Product Offering	• Specific product offerings • Mainframe and support services	• Family of compatible products requiring some external interfaces	• Full suite of product offerings usually requiring multiple vendors • Interfaces required with current and standard systems
	Technical Breadth	• Systems engineering and integration • Software engineering usually not required	• Some systems engineering and integration skills required • Software engineering and development usually required	• Systems engineering and integration skills required to accommodate multi-site environment typically involving computer network architectures • Wide range of software engineering required
	Program Management	• Minimal program management skills required	• Program management and support skills required to control software development and implementation process	• Strong program management and support organization required
MARKETING/ SELLING ORGANI-ZATION	Agency Relationship	• Broad agency understanding Familiarity with agency buying habits and processes	• Good understanding of specific organization needs and biases • Sufficient contact with technical buyers to establish credibility	• Intimate understanding of specific factors and applications • Working understanding and current systems environment and systems standards • Personal relationship with technical buyers
	Functional Expertise	• Broad understanding of agency functions and work processes	• Specific organization functional and applications expertise required	• Working understanding of existing applications and work flows • Strong understanding of current automated systems user interfaces
	Selling Resources/ Approach	• Broad product sales and services support • Sales coverage with agency buying authorities	• More technical sales force with both product and services understanding • Problem solving selling approach to users and technical representatives	• Large "expert" selling teams • Problem solving selling approach • Ability to demonstrate required expertise
	Teaming Relationship	• Direct contracting for secondary products or maintenance services if required	• Mix of hardware vendors and services contractors usually required • Can be non-exclusive	• Exclusive teaming arrangements for specific expertise • Mix of exclusive and non-exclusive products
CORPORATE RESOURCE	Financial/ Contract Administration	• Product focused contracting and pricing	• Product and services focused contracting and services • Software estimating and pricing often on fixed price basis	• Product and service focus • Hybrid contracting and pricing • Full life-cycle systems management pricing • Subcontract administration
	Facilities	• No unique requirements	• Access to benchmark facilities	• Benchmark facilities • Data centers for in-house development • Full systems management support skills
	Human Resources	• Product and maintenance support staff • Typically single site	• On-site development support staff • Program management teams	• Full systems management support skills • Multi-site support

B10065(T)

LEGISLATION	IMPACT ON THE PROCESS
PL 89-306 Brooks Act	• Strong centralized oversight Lengthened procurement lead time
PL 93-400 OFPP Act	• "Try before you buy" Greater contractor accountability through systems life cycle
PL 96-511 Paperwork Reduction Act	• Greater agency autonomy Even greater contractor accountability
PL 98-369 Competition In Contracts Act	• Virtually eliminated sole source/directed procurement Bundling requirements